yet he cannot be considered to have invented a chemical process industrially applicable for this purpose. The merit of having invented the series of reactions now forming the ammonia-soda process remains thus undiminished with Messrs. Dyar and Hemming, who, as far as can be inferred from Mr. Thom's letters, have worked quite independently of him and without knowledge of what he had been doing.

According to information, for which I am indebted to Mr. Richard Muspratt, Messrs. Dyar and Hemming built a small works to demonstrate their process in Whitechapel very shortly after taking out their patent. These works were regularly visited by Dr. Sheridan Muspratt and Mr. James Young of paraffin celebrity, then assistant to Professor Graham in London, in order to study the process. Shortly afterwards, probably in 1840, Mr. James Muspratt engaged Mr. Young to erect plant for the process on a considerable scale, at his large chemical works at Newton. This plant was worked under Mr. Young's direction for about two years, when the process was given up because it was found more expensive than the Le Blanc process, principally on account of the heavy loss of ammonia. Mr. Carrol, at the time foreman of the works at Newton, has told me that about £8000 were spent in this experiment.

It is well known that various other attempts to work the process were made about this time on the Continent, amongst others, by Kunheim in Berlin, and Seybel in Vienna. A few years later a small plant was erected near Leeds by Mr. Bowker, and kept at work for several years, the product being regularly sold in the district, but this also was subsequently abandoned. The first attempt to construct a more perfect plant for carrying out the process was made by Mr. William Gossage (patent of 21st February, 1854). In the same year, and following each other in close succession, patents were taken out by Turck (26th May), Schloesing (21st June), Henry Deacon (through his agent, Henry Johnson, 8th July). I am informed by Mr. Holbrook Gaskell, who entered into partnership with Mr. Deacon in 1854, that Mr. Deacon leased land for the purpose of erecting ammonia-soda works in 1853, and that in the following year he was already engaged in the manufacture of ammonia-soda, which he carried on for about two years at the rate of several tons per day. After a sum of from five to six thousand pounds had been expended upon it, the firm decided to abandon the ammonia-soda process, and commenced the erection of the large Le Blanc Soda Works, which have since become so well known, and which have proved such a fruitful field for the display of Mr. Deacon's great powers as a manufacturer and as an inventor.

Judging from Mr. Deacon's patent, and from what he has told me himself many years ago, the plant which he used for making ammonia-soda was very similar to that described by Messrs. Schloesing and Rolland in their patent of 1858, except that Mr. Deacon went a considerable step further than these gentlemen by using carbonic acid under pressure. He used horizontal cylinders with agitators for absorbing the carbonic acid, and a still of the Coffey type for recovering the ammonia.

Messrs. Schloesing and Rolland commenced in 1855 to erect works at Puteaux, near Paris, which were kept going for two years, and during this time produced 316 tons of soda—86 tons during the first 14 months, and 230 tons during the last ten. At the end of the two years the experiment was given up, like all the preceding ones had been, although the soda manufactured was sold at a price varying from 65 to 75 francs per 100 kilogrammes, equal to £26 to £30 per ton, or about five times its present value. Messrs. Schloesing and Rolland assert, in a very lengthy paper published in 1868 (*Ann. de Chimie und Physique*, T. xiv.), and this assertion has been repeated by various writers, that their want of success has been due, not to the insufficiency of their apparatus, but solely to the high tax levied on salt at the time in France. They state that they had to use 180 kilogrammes of salt per 100 kilogrammes of soda, where the Le Blanc makers used 150 kilogrammes, and that the tax they had to pay on this extra quantity of salt made competition impossible. This duty amounted to 10 francs per 100 kilogrammes of salt. Messrs. Schloesing and Rolland would thus have to pay 3 francs per 100 kilogrammes of soda more than their competitors, an amount very much below the difference in cost of production between the two processes at the present time. The total tax they had to pay on salt would have amounted to 18 francs per 100 kilogrammes of soda manufactured. The selling price of soda at the time being 65 to 70 francs per 100 kilogrammes, Messrs. Schloesing and Rolland ought to have realised enormous profits in spite of the tax if they had at all understood the manufacture. The selling price to-day is below 18 francs per 100 kilogrammes, and this leaves a very handsome profit. Moreover, it would have been easy to reduce the quantity of salt consumed per ton of soda in the ammonia-soda process to a less quantity than is used in the Le Blanc process, by recovering the undecomposed salt from the residual liquor of the distillation. We can, therefore, not accept the assertion that but for the salt duties Messrs. Schloesing and Rolland could have manufactured at a profit; their own figures prove plainly that their experiment was no more successful than their predecessors; that it was not carried out on any larger scale, nor persevered with for a longer period of time.

After 1858 no further serious attempts were made to overcome the engineering difficulties of the ammonia-soda process, until Mr. Ernest Solvay undertook this task in 1863. It is now a matter of history how completely Mr. Solvay succeeded, after five years of incessant work, under trying circumstances, in inventing and working out new apparatus for carrying out on a large scale all the various operations of Messrs. Dyar and Hemming's beautiful but hitherto barren invention; how quickly the ammonia-soda manufacture has developed in his hands, and what enormous proportions it has attained in a comparatively short time. While recognising Messrs. Dyar and Hemming as the inventors of the chemical operations which constitute the ammonia-soda process, we have to give to Mr. Solvay the honour of being the inventor of the apparatus, which alone has made this process of value to the public, and of having thus become the founder of the ammonia-soda industry.

Journal and Patent Literature.

I.—GENERAL PLANT, APPARATUS, AND MACHINERY.

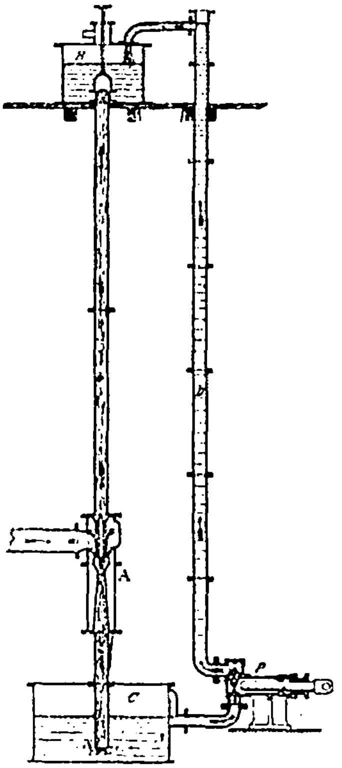
Improved Process and Apparatus for Purifying Water used in Steam Boilers. D. Clerk, Glasgow. Eng. Pat. 10,815, July 31, 1884.

The water of the boiler is made to circulate, by means of pipes and a steam pump, through a filter, and is redelivered at the upper part free from the solid matters which separate from it during evaporation. The feed water is also caused to pass through the same filter.

—C. C. H.

Improvements in and Apparatus for the Production of a Vacuum in the Evaporation or Refrigeration of Liquids. G. Hambruch, Berlin. Eng. Pat. 11,485, August 21, 1884.

To produce a vacuum more quickly and efficiently than by means of ordinary pumps, under such circumstances as the evaporation of liquids under reduced pressure, it is proposed to use an aspirator, or liquid jet pump resembling a "Körting's aspirator," worked by a liquid such as sulphuric acid, caustic soda, etc., which readily absorbs aqueous vapour. The best results are obtained by aspirators delivering the liquid in flat sheets or annular jets. In the annexed illustration A is the aspirator, *a* is the *pipe from the vessel to be exhausted*, B the reservoir for supplying the liquid under pressure, and P the pump for returning the liquid to B. The absorbing liquid becomes diluted and must be changed at intervals.



—C. C. H.

Improved Apparatus for obtaining Fresh Water from Salt Water. J. Weir, Glasgow. Eng Pat. 11,865, September 2, 1884.

The apparatus consists of three vessels placed in series, and intended to be worked in conjunction with the engines and boilers of a steam-ship. The vessels are upright cylinders, provided with a tight cover, and a worm in the interior. The first vessel communicates with the worm of the second, and the worm of the third is a continuation of that of the second. The first of the series is filled with sea-water, steam is admitted to the worm from the boiler, or the exhaust of the main engines, and the vapour thus generated is condensed in the worm of the second vessel, and, passing over into the worm in the third, is cooled by a current of cold sea-water. The condensed water from the steam admitted into the coil in the first is returned to the hot well of the engines. The second vessel communicates with the condenser of the main engines, so that the vapour given off is condensed and returned to the boilers to make up for the loss due to waste in the whole system.

—C. C. H.

Improvements in the Manufacture of Asbestos Micro-membranes for Filtering Purposes. O. Imray, London. From F. Breyer, Vienna. Eng. Pat. 5864, May 12, 1885.

This invention relates to the manufacture of thin layers of asbestos felt suitable for filtering purposes. Only those asbestos fibres are suitable which, when ground, give a woolly product, and not a powdery one. After reduction to this state, by a mill or edge-runner, the product is chopped so fine that the fibres do not exceed 0·2 inch in length. It is then mixed with crystalline carbonate of lime, or magnesia, the granules of which do not exceed 0·2 inch in size, and ground with water so as to effect a further reduction. The semi-fluid resulting is then treated with an acid to remove the carbonates. After washing, to remove the excess of acid, the emulsion is ready to be filtered. This is best carried on by depositing successively even layers upon a woven fabric stretched on a frame. When a felt of sufficient thickness has been obtained, the fabric to which it adheres is dried in a kiln, and the whole is then ready for use.—C. C. H.

Improvement in Filter Presses. O. Imray, London. From H. B. Scott, Calais. Eng. Pat. 5903, May 13, 1885.

The improvement described consists in forming the plates of a filter-press of flat sheets of wrought-iron, the plates being covered with cocoa-nut matting, to form a soft bedding and a drainage surface. The filtering cloth is fixed on the plates in the usual manner. The chambers are formed by the interposition of distance frames between the flat plates.—C. C. H.

Improvements in Concentrating Aqueous Solutions, etc., and Apparatus therefor. W. P. Thompson, Liverpool. From A. Büttner and C. Meyer, Merdigen. Eng. Pat. 6065, May 18, 1885.

The concentration of liquids is to be effected by direct contact with the products of combustion, generator gases, etc., without subjecting the concentrated material to burning. The gases are first deprived of ashes and soot by passage through a V-shaped chamber, the solid matter being thrown down into a pocket by a curtain wall. The hearth of the evaporating furnace is divided by cross walls into compartments, into which the concentrated materials successively flow. In each of the compartments there is one or more gratings suspended, with the bars vertical and provided with cams and rods for alternately lifting them out of and lowering them into the liquid. The bars are toothed or serrated so that they pick up more liquid. The current of hot air is passed over the liquid, and hence through the gratings and the liquid raised by them, and the heat is uniformly conveyed through the body of the liquid. The solid matter from the end of the hearth is conveyed by a creeper into U-shaped vessels, through which currents of hot air are passed, rakes and scrapers at the same time keeping the semi-solid matter from balling. The passage of the matter is so arranged that dry matter is discharged from the end trough of the series.—C. C. H.

Apparatus for making Fresh Water from Salt Water. A Chapman, Liverpool. Eng. Pat. 11,461, August 29, 1884.

Refer to Branch XVII. (*B*) of the present number of this Journal.

II.—FUEL, GAS, AND LIGHT.

Improvements in the Manufacture of Illuminating Gas from Hydrocarbon and other Oils, and in Apparatus therefor. A. J. Boult, London. From J. Hanlon, New York. Eng. Pat. 802, January 20, 1885.

The operation of the apparatus, for the construction of which the patent must be consulted, is as follows:—Heating gas is generated in a producer, partially burned in a retort chamber, and passed on to one of the fixing chambers, where a further air supply completes its combustion. When all is heated to the proper temperature, the gate valves are reversed, turning the heating gas into the other fixing chamber and opening the connection between the retorts and the now heated fixing chamber. Oil is admitted to the one and superheated steam to the other compartment of each retort. The steam passing downwards through the heated charcoal is decomposed, and, passing through the aperture in the partition, assists in the vaporisation of the oil, the hydrogen acting as a carrier for the rich, heavy hydrocarbon vapours, which would otherwise probably condense in the connections. The mixed gases pass onward to the fixing chamber, whence they emerge as a homogeneous illuminating gas of high candle-power.—A. R. D.

Improvements in the Construction of Coke-Ovens. A. F. Link, London. From T. Bauer, Munich. Eng. Pat. 11,040, May 7, 1885.

THIS specification describes a coke-oven system claiming economy of space, building material, and working expenses, with a superior quality of coke. See this Journal, vol. iv. 485 and 486.—A. R. D.

An Improvement in Coke-Ovens. Henry Simon, of Weissbad, Apenzell, Switzerland. Eng. Pat. 12,340, June 2, 1885.

THIS invention is a modification of that described in Specification 554, of 1883 (this Journal, vol. iii. 507). Therein it is shown how the products of combustion on their way to the chimney are employed to heat the air or combustible gas required for the working of the ovens. This is done by causing the latter to traverse flues adjacent to those in which the former are passing away, forming what is known as a recuperator. In this way the air was frequently rendered hotter than was necessary, and, therefore, according to the present invention, cross-flues or channels, having openings provided with valves and dampers, are constructed at various points in the length of the longitudinal recuperator flues, so that the cold air can be admitted at these different points and be made to take up more or less heat according to the length they have to traverse on their way to the combustion chamber.
—A. R. D.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, Etc.

Coal-Tar Creosote. Dr. Tidy. Analyst, **10**, 115.

THE author suggests the following as an amendment to the late Dr. Voelcker's specification for coal-tar creosote. 1. The creosote to be completely liquid at a temperature of 100° F., no deposit afterwards taking place until the oil registers a temperature of 95° F. 2. Creosote to contain at least twenty-five per cent. of constituents which do not distil over at a temperature of 600° F. 3. That, tested by the process afterwards described, the creosote shall yield a total of eight per cent. of tar-acids. 4. There shall be no admixture of bone-oil, shale-oil, or other substance not obtained by the distillation of coal-tar, and the first twenty-five per cent. of the distillate shall have a specific gravity greater than that of water. *Process for determining the coal-tar acids:*—1. 100cc. of the well-mixed creosote to be distilled at 600° F. until no further distillate comes over. Distillate to be mixed and well shaken in a stoppered flask, with 30cc. of caustic-soda solution (sp. gr. 1·200). Mixture then to be heated, and afterwards again shaken vigorously. The contents of the flask are now to be placed in a separating funnel, and the soda solution is drawn off. The creosote is to be heated a second and a third time in a similar manner with caustic-soda solution, only 20cc. of soda solution being used, instead of 30cc., as in the first extraction. 2. The three soda solutions are now to be mixed together. When cold, any particles of creosote are to be got rid of by means of a separating funnel. The solution is now to be thoroughly boiled, in order to expel the last traces of creosote present in the solution. The mixture is then to be allowed to cool. When cold, about 35cc. of sulphuric acid (one of acid to three of water) is added, until the solution becomes slightly acid to litmus. The whole is then transferred to a separating funnel, and allowed to stand until quite cold. The tar-acids are now to be dissolved in 20cc. of the caustic-soda solution and 10cc. of water, and the mixture is boiled and filtered through asbestos. The latter is to be washed with not more than 5cc. of boiling water. The solution is allowed to cool *perfectly* in a 100cc. measure; it is then slightly acidified with sulphuric acid (one to three), and again allowed to stand for two hours, until perfectly cold, when the percentage of the tar-acids (by volume) is to be read off. *Process to be adopted in estimating the quantity of distillate:*—The operation is to be conducted in a retort fitted with a thermometer, and heated with the naked flame of a Bunsen burner. The heat is gradually to be raised to 600° F., and continued at that temperature until no further matters distil over. The distillation of the 100cc. should be completed within an hour.—E. G. C.

An Improved Method of and Apparatus for Extracting Tar and Ammonia from the Gases of Blast Furnaces. J. Dempster, Newton Heath. Eng. Pat. 11,250, August 14, 1884.

THE apparatus employed is placed in a position between the blast furnaces and the steam boilers or stoves to which the gases from the furnaces are conveyed. It consists of an ordinary ammonia still, with its usual "sulphate" apparatus, and of "dust boxes" and "condensers." The gases are afterwards taken to "washers" and "scrubbers," where the last traces of ammonia are absorbed, and after leaving the scrubbers they are conveyed to the boiler furnaces.—D. B.

Improvements in the Treatment of Oils and Tars obtained from Blast Furnaces and Gas Producers for the Production of Valuable Hydrocarbons therefrom. C. E. Bell, Durham. Eng. Pat. 12,681, September 22, 1884.

IN a former specification (Eng. Pat. 9510, 1884), the treatment of oils and tars obtained from coke-ovens was described, the object being the production of hydrocarbons of the benzene, naphthalene, and anthracene series. The inventor has since discovered that a similar treatment is applicable to oils and tars obtained from blast furnaces and gas producers by passing such oils into a retort heated to or beyond a full red-heat, and by preference charged with coke.—D. B.

IV.—COLOURING MATTERS AND DYES.

A New or Improved Process for the Manufacture of Napthol Carbonic Alkaline Salts, and also their Subsequent Treatment for the Production of α- or β-Carbonaphthol Acid Alkaline Salts. From Dr. Carl Kolbe and Carl Reutsch, of Radebeul, Saxony. Eng. Pat. 6134, May 19, 1885.

THE authors act upon dry alkaline salts of α- or β-naphthol by dry carbonic anhydride to produce the alkaline salts of the acid carbonic α- or β-naphtholethers—

$$\left(C_{10}H_6\overset{\alpha \text{ or } \beta}{(OH)}(COOH)\right).$$

The alkaline salts of the α- and β-naphthol are treated with carbonic anhydride, at ordinary temperatures, and after lapse of time and frequent stirring, the conversion of the naphthol salt into naphthol carbonic salt (oxynaphthoic acid salt) is completed; then the vessel is heated to 120—140° C., in order to effect conversion into simple α- or β-oxynaphthoic acid salt. Dry alkali naphthol salts are placed in an autoclave and sufficient solid carbonic acid is thrown in to bring about the formation of the naphthol carbonic alkaline salt.—T.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

On Rhea Ramie Fibre, or China Grass. From a Lecture delivered in the Manchester Technical School, July 21, 1885. By Dr. Forbes Watson.

THERE are two principal varieties, the one *Boehmeria nivea*, or *Urtica nivea*, with a white underleaf, and the other, *Urtica utilis*, with a green underleaf.

In China, when the stalks are cut, the bark is stripped off at once by hand, and this can be very easily done when the stems are quite fresh, and in this case the bark contains the whole of the fibre. The China grass of commerce is obtained by scraping this bark by hand by means of a knife, but only a small quantity can be produced per day by these means. In China a very clever worker can produce up to two pounds of fibre per day, while on the average only a half to one pound is generally obtained. In experiments made in India with unskilled labour, the production was very small indeed, in fact, not more than four ounces per day could be produced by each worker. As will be easily understood, this slow method of preparation has prevented the development of the industry.

China grass, as usually imported, varies from three to four feet in length, and therefore it can be inferred that the plant is allowed to reach a height of 3½ to 5 feet.

China grass contains from twenty-two to twenty-eight per cent., and in some cases up to thirty-five per cent. of gum; this has to be removed in order to obtain the pure fibre capable of being spun.

In Beheea, in Bengal, the bark is simply stripped off from the stalks, and dried, and is then brought into commerce in this raw state.

When the stems have been cut for any length of time the stripping by hand could not be performed without leaving a certain amount of the fibre adhering to the stalks, while if the stems are fresh the amount of fibre left behind is very insignificant.

The Favier's process consists in exposing the stems in the green state to the action of steam for fifteen to thirty minutes in a wooden box, after which the bark can be very readily stripped off by hand; by this process also those stems can be treated which have been standing for some time after being cut, without leaving any appreciable amount of the fibre adhering to the stalks.

Some years ago Dr. Watson made numerous experiments on a large scale with the dry stems sent him by the India Office, and he proved that it is not at all difficult to obtain the fibre when the stems are quite dry.

In his report to the Government he called attention to the importance of this treatment of the dry stems, but the reply was to the effect, that it is all very true if the stems can be dried, but the best crops are obtained in India during the rainy season, when it is all but impossible to dry them, except by expensive artificial means. They are, if not quite dry, very liable to ferment, and this results in the spoiling of the fibre.

The Government of India has for many years been endeavouring to find out a machine capable of treating the stems in the green state, and very many trials have been made. In the competition of October last in Calcutta, the Death and Elwood machine was found successful for the separation of the raw fibre from the wood. The fibre produced Dr. Watson had found to contain fifteen to twenty per cent. of gum, but in some instances the figure is as low as five per cent.

The machine is also useful for the separation of the fibre from the pine-apple leaves and the agaves and other plants. It consists of a cylinder with beaters revolving at a high speed in front of a table where the stocks are introduced, being pushed against the beaters, which separate very quickly the wood from the fibre; a jet of water is supplied which helps considerably in the cleansing of the fibre, either by washing off the gum and other soluble matters or by keeping the fibre up to the action of the beaters, and in this case the water acts also as a kind of cushion. The stems are treated so, that after half of their lengths has passed through, they are taken out and the other half is exposed in its turn to the action of the beaters.

The cost of producing the fibre by this machine is estimated by Dr. Forbes Watson to average £4 to £5 per ton, but in no case did it exceed £7. The yield from the machine was from one to two tons of green stalks per day, and he expected that, properly worked, this would produce about 100lbs. of cleaned fibre.

In order to utilise the China grass for industrial purposes it was necessary to deprive it of its gum, and make it into pure fibre ready for spinning. Different chemical methods have been recommended for the purpose of ungumming. As to the question, "Which is the best process?" Dr. Watson saw the Frémy-Urbain process at Paris some time ago, but thought it was very imperfect. Since, then, however, it has undergone several improvements, as the abstractor (Mr. A. Sansone) can also testify, having lately seen it in Paris. The process is principally applied for the treatment of the dry barks or ribbons obtained by the Favier's steaming method.

Dr. Watson thought that in some cases the fibre might be injured by this process, or, at all events, that the amount of short fibre or noils obtained when spinning the material so prepared would be much larger than it ought to have been, and that consequently the amount of longer fibre, which fetched a much higher price, would be considerably reduced. He evidently objected to the use of pressure boilers or kiers for the treatment of the material with caustic soda, and stated that the operations of ungumming could be carried on without such apparatus; he had also seen samples successfully ungummed by other workers, and he knew of at least twenty processes which had been recommended. The question was not if the operations could be carried out on small samples, but if they can be conducted on a manufacturing scale. What is now principally wanted is raw material to work upon. Dr. Watson did not believe that in all Europe there is as much as forty tons of the fibre at the present moment. He thought that the cultivation of the plant ought to be extended and encouraged. The beautiful patterns of yarns and fabrics exhibited showed what was being done on the Continent. In reply to a question as to what kind of flowers and seeds the plant bore, Dr. Watson said that none of the plants they had in India had produced fertile seeds. The amount of pure fibre obtained from the green stalks was from two to three per cent., in some cases up to 3¾ per cent.

Mr. Sansone, who said he had lately been in Paris and Louviers to see the Frémy-Urbain process at work, stated that the treatment of the plants in the green state was suitable principally for large plantations, but for small cultivators like those found sometimes in his own country (Italy) it would be less suitable; they would have to deal with the dry stems, or strip the bark by hand, for as the peasants only cultivate small plots of ground they could not afford to put up either boilers or machinery for the treatment of the green stems.

As regards the employment of pressure kiers, the ungumming *could* be performed without them, but it had been found that a certain amount of pressure facilitates the operations considerably, as it allows the liquor to penetrate through the mass; this is of importance when working on large quantities. On the amount of very long fibre yielded by *any* process, no great stress need be laid, since the long fibre is generally cut in lengths of eight to ten inches before spinning. In the opinion of practical men engaged for years in the manufacture of China-grass goods, it would be even an advantage to have only to deal with a short fibre.

From what Mr. Sansone had seen in the ungumming processes as carried on at Paris, or rather at Louviers, he considers that there is neither in the chemicals nor in the treatment anything to injure the fibre, if the operations are performed with care. The process resembles in a certain sense the scouring and bleaching processes as generally carried on with cotton-goods in Lancashire.

Method of rendering Cloth, Wood, or Paper Waterproof, but not Air-tight. N. A. Alexanderson, Stockholm. Eng. Pat. 15,023, December 3, 1884.

THIS invention is based upon the well-known property of fibres of decomposing certain salts—*e.g.*, those of alumina,—alumina or a basic salt being taken up by the fibres and preventing water from moistening them. In this way it is possible to give a cloth a certain amount of impermeability by the double decomposition of lead acetate and aluminium sulphate. An improvement on this method consists in giving the tissue so treated a subsequent rinsing in a soap solution, whereby an aluminium soap is produced. A very essential improvement consists in depriving the salts used of their acid property, which is injurious to impregnation, and so to increase the capacity of fibres for alumina. Inventor has attained this result by using basic salts instead of the acid compound formerly employed. These basic salts are obtained by neutralising alum, sulphate or acetate of alumina, or any suitable salt of aluminium by equivalent quantities of any neutralising matter—*e.g.*, the carbonates or hydrates of the alkalis and of alkaline earths or hydrates of heavy metals. Thus the following equation may be considered a type :—

$$Al_2O_6.3(SO_2) + CaO_2H_2 = CaO_2.SO_2 + Al_2\left\{\begin{matrix} O_4.2(SO_2) \\ O_2.\ H_2 \end{matrix}\right.$$

Basic Salt.

Inventor may use tartaric or citric acid or glycerol to prevent premature deposition. Basic salts deposited *in statu nascendi* are easily taken up by the fibre. Aluminate of soda and basic chromium and iron salts may also be used.—H. A. R.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, AND BLEACHING.

Improvements in Machinery for Dyeing Textile or Fibrous Materials. W. R. Lake, Middlesex. From C. Corron, France. Eng. Pat. 11,824, August 30, 1884.

This invention relates to apparatus for mechanically dyeing spun materials, which are wound into skeins, and preventing the skeins from becoming entangled with each other. The apparatus may be used for boiling, washing, mordanting, brightening, and staining silks, cotton, wool, linen, China grass, or any textile or fibrous material, by the submersion of a frame charged with skeins, and by the rotation of rollers. For drawings and details the original specification should be consulted.

—H. A. R.

VII.—ACIDS, ALKALIS, AND SALTS.

A New Variety of Pyrites for Sulphuric Acid Manufacture. Drinkwater. Analyst, 10, 109.

The author, after referring to the fact that pyrites nearly always contain arsenic, gives analyses of two samples recently examined by him, and found to be free therefrom. One was a Welsh pyrites, the other Algerian. The former contained :—

Insoluble matter	5·8
Sulphur	48·3
Iron	42·1
Arsenic	nil.
Alumina	1·4
Carbonate of calcium	2·5
	100·1

The Algerian pyrites contained :—

Sulphur	44·8
Insoluble...	5·2
Iron	46·6
Lead	0·02
MnO_2	0·22
Calcium carbonate	3·1

The acid manufactured from the Welsh pyrites contained :—

Hydrated sulphuric acid	97·14
Water	2·820
Sulphate of lead	0·003
Saline matter	0·031
Arsenic	nil.
Nitrogen compounds	nil.
	99·80

This acid is as good, for any commercial purpose, as the best sulphur acid, and is much cheaper. The Welsh ore is raised from the Cae Coch Mine. The sulphur known as recovered sulphur is not always free from arsenic. The following figures represent the amounts of arsenic discovered by Dr. Drinkwater in various specimens of pyrites, and in one of recovered sulphur :—

	1.	2.	3.
Cornish pyrites	0·93	0·56	0·5
Norwegian ,, ...	0·32	0·20	—
Belgian ,, ...	0·40	1·03	0·22
Spanish ,, ...	1·81	1·65	0·89
Irish ,, ...	2·00	—	—
Recovered sulphur......	0·68	—	—

—E. G. C.

Improvements in obtaining Hydrochloric Acid Gas from a Solution of Hydrochloric Acid. W. Lloyd Wise, London. From Messrs. Solvay & Co., Brussels. Eng. Pat. 12,421, March 18, 1885.

The solution of hydrochloric acid is introduced into a nearly boiling solution of calcium chloride so concentrated that the boiling point of the mixed liquids does not fall below 100° C. A solution of calcium chloride boiling at 150° C. to 160° C. answers very well. Agitation is produced by suitable means, and the hydrochloric acid is evolved in the gaseous form, while the water in which it was dissolved is retained by the calcium chloride. The operation may be made continuous by passing through an apparatus divided into several compartments a current of hot calcium chloride solution, and at the same time such a quantity of liquid hydrochloric acid as it is capable of decomposing. To the calcium chloride solution remaining at the end of the operation a little lime or carbonate of lime is added to neutralise the traces of acid retained. It is then concentrated and used over again.—A. R. D.

An Improved Method of Making Sodium Carbonate and certain By-products. W. Robinson, Gateshead. Eng. Pat. 10,080, April 10, 1885.

The inventor intimately mixes together common salt, pulverised coal, or other carbonaceous material, and sulphuric acid. The mixture is heated in a furnace, and the evolved gases treated for the recovery of hydrochloric acid, sulphurous acid, and sulphuretted hydrogen. The contents of the furnace are treated by certain well-known methods for the production of sodium carbonate, sodium bicarbonate, soda ash, sulphur, sulphuretted hydrogen, etc.—A. R. D.

Improvements in Furnaces for Chemical Processes. J. Mactear, Glasgow. Eng. Pat. 10,812, July 31, 1884.

This specification describes improvements upon patents 4870 of 1879, and 4511 of 1880, granted to the author, and their object is to so apply the heat that the fire gases may not come in contact with the materials to be furnaced or be mixed with the gases evolved therefrom. The improvements will be better understood by reference to the annexed drawings. The revolving bed of the furnace (3), made of fire brick and bound with the iron or steel frame (4), is rotated on the rollers (5) by the pinion (34) and the rack (33). Above the bed is the domed crown of the furnace (8), and immediately over this the flue (9). Under the bed another flue (10) is formed; the gases from the furnace (13) circulate above and below the rotating bed. Entering the flue (9) from the passage (12) communicating with the source of heat, the hot gases pass between walls (11), Fig. 1, across the centre of the crown, and diverging right and left escape down the vertical flues (14), and emerge into space (10) by flues (15) and (16). From thence they pass by openings (18) into exit flue (17). The material furnaced overflows the edges of the hearth into the ring (20), and with the curb (23) forms a lute between the interior of the furnace

FIG. 1

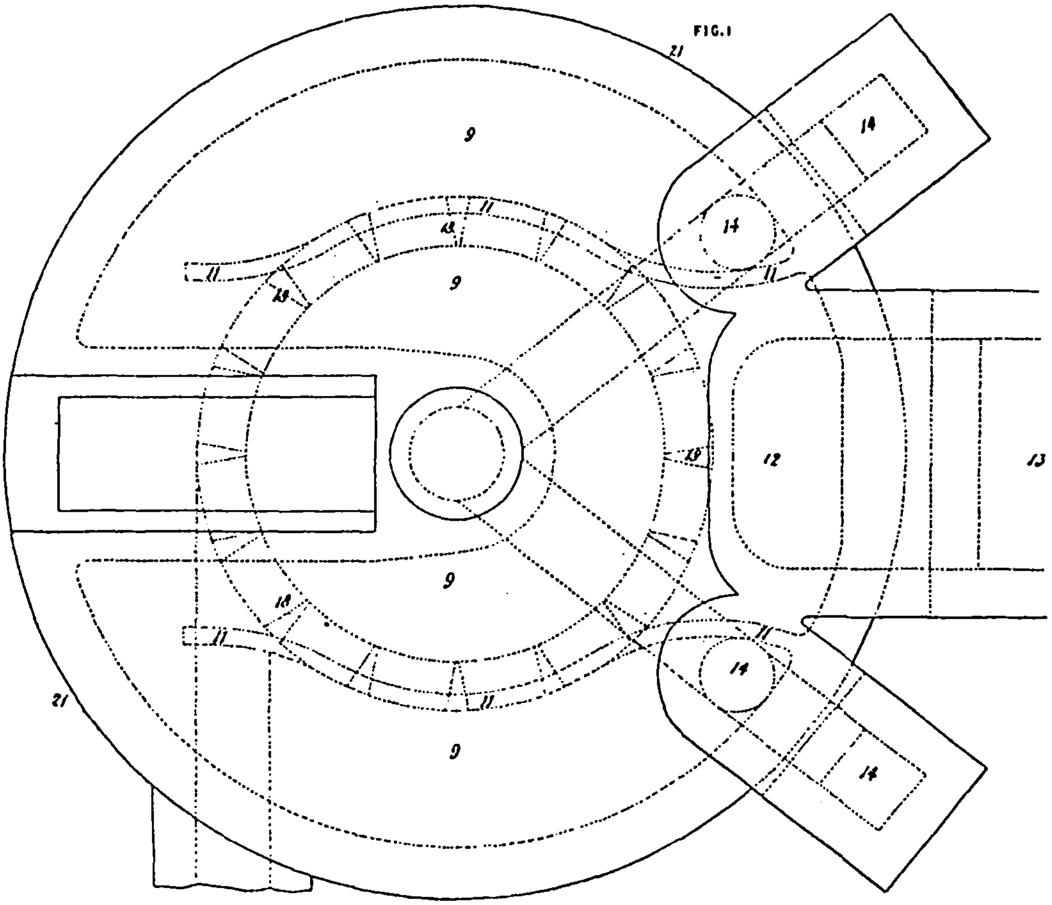
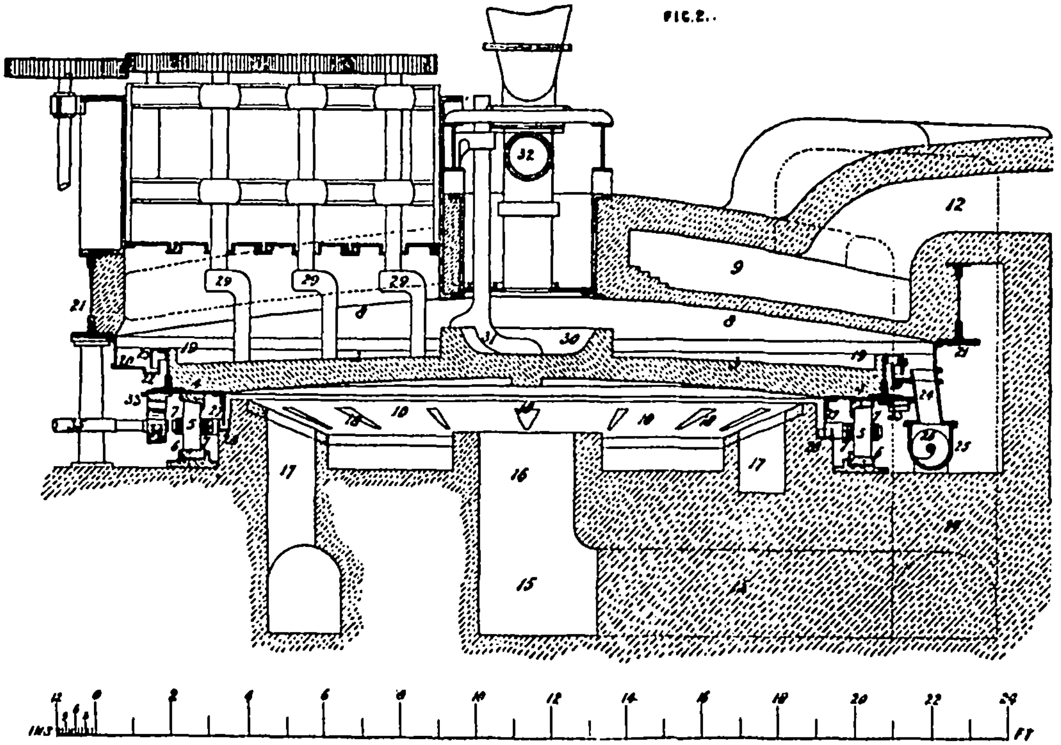


FIG. 2.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and the air. A similar device (27) and (28), the trough being filled with sand, lutes the flue (10) against the air. The furnaced product is removed continuously by hopper (24) and creeper (25). Stirring gear (29), as at present used, is provided, and when applied to salt cake the fixed plough (31) and centre pan (30), to effect a partial preliminary decomposition, are also used. The patentee claims the improvements as described. (See this Journal, vol. i. 27—29.)—C. C. H.

A New or Improved Process for the Production of Phosphate of Soda, or of Potash from Basic Process Slags, and other Phosphatic Materials. W. P. Thompson, Liverpool. From Luigi Imperatori, Düsseldorf, Germany. Eng. Pat. 5216, April 27, 1885.

100 PARTS of slag (containing say 50 per cent. lime, 5 per cent. of magnesia, 19 per cent. iron, 20 per cent. phosphoric acid, and 6 per cent. silicic acid) are mixed with 176 parts of sulphate of soda and 74 parts of coal. The mixture is worked in a black-ash furnace, and the semi-fluid mass so obtained is moulded into blocks. These blocks must first be treated in any suitable way with carbonic acid gas to convert the caustic lime which they contain into carbonate. After this they are lixiviated, by which a solution of mixed carbonate and phosphate of soda is obtained. These salts are separated by crystallisation. If the blocks above mentioned were lixiviated directly with water the caustic lime present would cause the almost entire reversion of the phosphate. In preparing the mixture for the furnace it is well to use an excess of slag.—A. R. D.

Improvements in Apparatus for Carbonating Liquids or Semi-fluids. F. G. Riley, Vauxhall, London. Eng. Pat. 11,880, June 2, 1885.

THE apparatus, with its improvements, is designed for the conducting of carbonic acid through liquids, so that convenience in manipulation, economy of time and safety are secured. The blue-book, with its drawings, must be consulted.—A. R. D.

VIII.—GLASS, POTTERY, AND EARTHENWARE.

Improvements in the Production of Toughened Glass, and in Apparatus therefor. C. D. Abel, London. From La Compagnie Général du Verre et du Cristal Trempés, Paris. Eng. Pat. 10,748, July 29, 1884.

HITHERTO it has been usual in the operation of toughening articles of glass to heat them, after formation, in the same furnace in which the glass was originally heated by simply introducing them into the mouth of the furnace. The result of this is unequal heating, due in some measure to the configuration of the article. The present invention proposes to obviate this by the employment of a special reheating furnace either of the muffle form with two compartments, or else of the ordinary form, but with openings in the sides so that the thinner parts can be kept cool by exposure to the air, whilst the thicker parts are reheated prior to quenching in the bath. To ensure uniformity in the temperature of the oil-bath, the vessel is constructed either with double sides, filled with a non-conductor, or else a movable vat is used which can be placed in a screen or casing.—C. C. H.

An Improved Manufacture of Toughened Opal Glass Articles and Apparatus therefor. C. D. Abel, London. From La Compagnie Général du Verre et du Cristal Trempés, Paris. Eng. Pat. 10,768, July 30, 1884.

THE "toughening" process cannot be applied with advantage to articles made from opal glass. To render such objects amenable to this process the present invention proceeds thus :—Articles or sheets of opal glass are coated with ordinary crystal glass and can then readily be "toughened." Any device or pattern can be interposed between the two surfaces of glass, and thus be rendered permanent. A special furnace and appliances are necessary in operating upon articles made from sheets of opal glass as above described. The furnace in which the sheets are heated is constructed after the muffle pattern in order to secure uniformity of temperature. The articles after being moulded must be successively heated upon two moulds which are the reverse of each other, so as to bring the surfaces to the same temper. The invention is covered by two claims—(1.) The manufacture of articles of opal glass toughened as described. (2.) The apparatus used therein.—C. C. H.

Improvements in Gas Kilns for Burning Glass, China, Pottery Ware, and other such like Articles. G. W. Wilkinson, London. Eng. Pat. 1633, February 5, 1885.

THE improved kiln is constructed in wrought iron, of a Ω-shape, and the interior is heated by "atmospheric" gas burners. The exterior of the kiln is covered with fire-bricks, and the ends fitted with doors. The articles to be fired are placed on shelves in a closed chamber similar in shape to the furnace, into which it is run on wheels. When firing has proceeded to a sufficient extent the interior chamber may be removed and run into another chamber, where it is allowed to cool gradually. Three claims cover the invention.—C. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, CEMENTS.

Colouring Stone, Marble, and other Materials for Building and other Purposes. Baron de Liebhaber. Eng. Pat. 15,628, May 23, 1884.

THIS inventor uses a solution of nitrate or chloride of copper, followed by caustic soda and sulphides, for the purpose of dyeing stone blue, black, or bronze. Yellow prussiate of potash produces a pink or light red colour on marbles and calcareous stones in their natural state; but on those previously treated with salts of copper, a purple or dark red colour is produced. A blue colour is imparted to stones of any nature, impregnated with yellow prussiate of potash, by means of fluoric acid. On ferruginous stones, such as Bath stones, yellow Yorkshire sandstone, etc., a red colour is produced by coating the surface with a very fine layer of chlorate of potassium, and then directing upon it the flame of a blast lamp until the whole surface is reddened to a slight depth.—E. G. C.

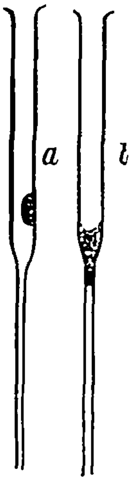
Improvements in the Manufacture of Artificial Stone and the Treatment of its Surface. Herbert John Allison. Eng Pat. 16,000, December 5, 1884.

THE artificial stone, slate, or marble, consists of various mixtures of sand and crushed stone with Portland cement, as follows :—Composition No. 1. By measure, four parts of ground slate, four parts Portland cement, one part (or less) of hydrate of lime mixed by sieving and made into a paste with water. Composition No. 2 has hydraulic lime (lime of Fiel) wholly or partially substituted for the hydrate of lime. Composition No. 3 same as No. 1, without lime. Composition No. 4. Four parts ground slate, four parts powdered limestone or marble, or sand, or a mixture of both; and one part of slaked or ground quicklime made into a paste with water. Nos. 5 and 6 are slight variations of above. These compositions are compressed or tamped into moulds and hardened by carbonating in a closed chamber, with water containing carbonic acid, or by the gradual action of the carbonic acid and moisture of the air.—H. R. P.

XI.—FATS, OILS, AND SOAP MANUFACTURE.

On the Examination of Fats. R. Bensemann. Rep. Anal. Chem. 11, 165.

AS a test of the genuineness and purity of fats, the author determines the melting point of the fatty acids insoluble in water in the following manner. A drop of the previously fused mixture of fatty acids is placed in the wide portion of a drawn-out tube, as shown at *a* in the figure, and is then allowed to completely solidify. The tube is now placed perpendicularly or nearly so in a beaker of cold water, containing a thermometer, and heated as gradually as possible over a very small flame, until some of the fat begins to flow down the side of the tube. The temperature observed at this moment is called by the author the "initial point of fusion." The application of heat to the water in the beaker is continued until the fat-drop has taken the appearance and position shown at *b*; and when the last trace of turbidity has disappeared the temperature is again read. This is the "concluding point of fusion." The author finds that this method gives very satisfactory and concordant results; the two points are very clearly marked and are about 3—4° C. from one another. With pure fats the concluding point is less clearly marked than with fatty acids; in the examination of the former, therefore, the initial point only need be noticed. The author takes 5grms. of the fat for saponification (with 2grms. of caustic alkali and 25grms. of alcohol). The fatty acids obtained by decomposing the soap with hydrochloric acid are thoroughly washed, first with cold and then with hot water. They are then dried at a temperature of 90—100° C. The drying must be continued until the acids cease to lose weight.



The following table contains some results obtained by the author:—

	Initial Point of Fusion of the Fat.	Percentage of Fatty Acids Insoluble in Water.	Initial Point of Fusion of Insoluble Fatty Acids.	Concluding Point of Fusion of Insoluble Fatty Acids.
Genuine Cows'-milk Fat	31—35° C.	87·77%	42—43° C.	45—46° C.
Sesame Oil	Fluid.	95·86	25—26	29—30
Cotton-seed Oil................	"	95·75	39—40	42—43
Olive Oil	"	95·43	23—24	26—27
Refined Rape Oil..............	"	95·11	18—19	21—22
Earth-nut Oil..................	"	95·86	31—32	34—35
Cacao Fat from—				
Maracaibo Beans..........	25—26° C.	94·59	48—49	51—52
Caraccas "	27—28	95·31	48—49	51—52
Trinidad "	26—27	95·65	49—50	52—53
Portoplata "	28—29	95·16	49—50	52—53
Machala Guayaquil Beans	28—29	95·21	49—50	52—53

—E. G. C.

XII.—PAINTS, VARNISHES, AND RESINS.

Treatment of Kieselguhr and Furnace Slag for the Production of a Material applicable for rendering Paints, Varnishes, and other Substances Fire-, Damp- and Weather-proof. Sir S. J. Blane, Bart. Eng. Pat. 9803, July 5, 1884.

POWDERED furnace-slag is treated with hydrochloric acid and steamed, and the jelly-like mass is strained through canvas and freed from acid by washing with water. The slag jelly is then well mixed with ignited and finely-powdered kieselguhr, and to this a little "lime water and gum, or glue solution, or both," are added.—E. G. C.

An Improved Black Pigment. J. Connor, Scotland. Eng. Pat. 11,930, September 3, 1884.

THE material employed is a bituminous or carbonaceous mineral, resembling coal and bituminous shale, and known as "bonnet." This mineral is ground to a fine powder, mixed with about five per cent. of lime, and heated in a retort. After being thus heated, the mixture is reground, and subjected to elutriation and other finishing processes.—E. G. C.

Improvements in the Manufacture of Sulphide of Zinc, and the obtainment of Sulphuretted Hydrogen and Sulphurous Acid as Products of the said Manufacture. J. H. Johnson, London. From T. Macfarlane, Montreal. Eng. Pat. 13,045, April 7, 1885.

ZINC, impure zinc oxide, or ores containing oxide or carbonate of zinc, are dissolved in hydrochloric acid till the latter is neutralised, and the solution is evaporated to a sp. gr. of at least 1·6 in lead or cast-iron pans. The chloride of zinc solution is added to a "sulphur liquor," prepared as below:—(1.) Two parts of quicklime are slaked and mixed with one part of ground sulphur, and boiled with water for two hours. (2.) One part of quicklime is slaked, mixed with one part of "spent oxide," and boiled with water for two hours. The solutions each contain hydrosulphate and hyposulphite (thiosulphate) of calcium, together with some pentasulphide. (3.) Ordinary tank waste from the alkali manufacture is exposed to the atmosphere for three or four weeks on an inclined water-tight floor. This is leached with water, and the solution so obtained is concentrated to from 10° Tw. to 20° Tw., by treating fresh quantities of weathered tank waste. It then contains from 2¼ to 2½ equivalents of sulphur to one equivalent of calcium. When this liquor No. 3 is used for the production of sulphide of zinc as above, there is an abundant evolution of sulphuretted hydrogen, which may be burned in a suitable furnace, and also utilised for vitriol making. The precipitated sulphide of zinc, after ignition, is used as a white pigment.
—A. R. D.

Improved Composition for Painting Railway Signals. Horace Wilmer and Thomas Bolas. Eng. Pat. 10,624, July 26, 1884.

The patentees use a spirit varnish similar to the "sealing-wax varnish" used for electrical purposes, and produced by dissolving shellac (seed lac, button lac, or stick lac) and Burgundy pitch in alcohol, wood spirit, or the mixture of the two known as "methylated spirit," and incorporating vermilion in the solution. The proportions recommended are—

Lac	1000	parts by weight.
Alcohol	1530	,, ,,
Burgundy Pitch...	200	,, ,,
Vermilion	800	,, ,,

—H. R. P.

XIII.—TANNING, LEATHER, GLUE, AND SIZE.

Preliminary Note on the Synthesis of Tannin. Bertram Hunt. Chem. News. **52**, 49.

It having been shown, lately, by Böttinger and others, that Schiff's digallic acid differs from gallo-tannin, and is probably only isomeric with it, it occurred to the author that possibly gallo-tannin might be produced by the action of mono-bromo-protocatechuic acid on potassic gallate. The reaction may be represented thus:—

$$C_6H_2(OH)_3COOK + C_6H_2Br(OH)_2COOH$$
$$= C_6H_2(OH)_3CO.O.C_6H_2(OH)_2COOH + KBr.$$

The experiment was made as follows:—Mono-bromo-protocatechuic acid was prepared by the action of excess of bromine on protocatechuic acid in the cold ("Watt's Dictionary," vi. 976). Potassic gallate—

$$(2C_7H_5KO_5.C_7H_6O_5 + H_2O)$$

was prepared according to the directions given in "Watt's Dictionary," ii. 761.

The bromo-protocatechuic acid and potassic gallate were cohobated together on the water-bath for about five hours, in presence of absolute alcohol, a slight excess of potassic gallate being used. The cold liquid was filtered through fine asbestos, and the alcohol evaporated off at a low temperature. The residue was dissolved in aqueous ether, and the solution filtered through asbestos. The ether was now evaporated off, and the residue dissolved in cold distilled water. The filtered, brown-coloured solution gave the following reactions:—It precipitated gelatin solution. It precipitated cupric acetate solution, and the precipitate was insoluble in ammonic carbonate. It gave a precipitate with tartar emetic solution in presence of ammonic chloride. It gave a black colour with ferric chloride, and, on standing some hours, a slight black precipitate. It reduced Fehling's solution readily on boiling. It precipitated cinchonine sulphate solution. The cinchonine precipitate was washed and carefully dried. The amount of cinchonine in it was determined by dissolving a weighted quantity in dilute sulphuric acid, boiling, and then precipitating the cinchonine in the cooled solution by a slight excess of caustic soda. The result was 31·56 per cent. cinchonine in the dry precipitate. $C_{20}H_{24}N_2O.2C_{14}H_{10}O_9$ gives 32·353 per cent. cinchonine.

These reactions are identical with the reactions of gallo-tannin, and are not given by either gallic or protocatechuic acid, or by a mixture of these acids. Further experiments are of course required to prove the identity of the substance produced with gallo-tannin.—W. S.

Improvements in the Manufacture of Substitutes for Leather. Maximilian Zingler. Eng. Pat. 3171, February 12, 1884.

A composition is made consisting of gum-percha 3½lb., powdered waste rubber 3½lb., indiarubber 7lb., sulphuret of antimony 3lb., peroxide of iron 1lb., flower of sulphur 1¼lb., lime 2¼lb., asbestos powder 4lb., sulphuret of zinc 1½lb., carbonate of magnesia 3¼lb. By gum-percha is meant the gutta-percha substitute described in Patent 1153, March 9, 1882. This mixture is worked through mixers, or iron rollers, and then vulcanised in a vulcanising press at 280° F., for an hour or more. This is to imitate heavy leather; for light, solid leather, powdered wood fibre, nut shells, or cuscus root is substituted for asbestos. Machine belts are prepared by soaking canvas in a bath of tannin and potash or ammonia alum, or tungstate of soda. It is then drained and steeped for twenty-four hours or more in a bath of sulphate of zinc, drained and allowed to dry. It is then coated with the composition above described, but without the waste rubber, and either dissolved in naphtha or worked up to a soft state between rollers. The canvas is doubled from two to twelve plies, and vulcanised for ½ to 1½ hour; for leatherine, canvas or calico, prepared as above described, is coated with a composition of india-rubber 7lb., substitute (as mentioned in Patent 242, January 15, 1883, under the heading of oxidised oil), 2½lb., sulphuret of antimony 3¼lb., peroxide of iron 1lb., sulphur ¾lb., sulphuret of zinc 2¼lb., carbonate of magnesia 5½lb., sulphate of baryta 2lb. This is vulcanised for half-an-hour, cooled, and if necessary again vulcanised. Thin leatherines are treated with a thin coating of india-rubber solution before applying the composition.

—H. R. P.

A Substitute for Whalebone, Steel, etc., for Stiffening Corsets, etc. Jas. Royle. Eng. Pat. 4578, March 8, 1884.

This consists in strips of buffalo hide, which (presumably first unhaired by liming in the usual way) are softened in cold water. They are then cut to required form, and dried in a current of cold air. After smoothing with pumice, they are rubbed on both sides with palm oil, to give the requisite elasticity, and again allowed to dry. They may be hammered or rolled to increase firmness, dyed black or otherwise, and polished or varnished.—H. R. P.

XIV.—AGRICULTURE, MANURES, Etc.

Influence of Malt-dust, and the Non-albumenoid Nitrogenous Compounds contained in it, on the Yield of Milk from Cows. M. Schrodt and H. Hansen. Bied. Centr. **14**, 246—248.

The experiments were arranged in three periods of twenty-five, thirty, and twenty-five days respectively. In all three the quantity of nutritious matter supplied in the fodder was approximately the same. In the first and third, or normal periods, the rations consisted of clover-hay, oat-straw, roots, wheat-bran, and cotton-seed cake, whilst in the second, or experimental period, the clover-hay and bran were in part replaced by malt-dust, the normal proportions of nutritious matter being sustained by slightly increasing the quantity of roots, straw, and cake, with the addition of starch and olive oil to equalise the carbohydrates and fat. This fodder, rich in nitrogen as amides, produced a slight increase in the total yield of milk, but the quality was rendered slightly inferior, inasmuch as the production of dry matter and fat suffered a very slight depression. It would appear, therefore, that the nitrogen as albumenoids in fodder may be replaced, to a certain extent, by nitrogen as amides, without exerting any noteworthy injurious influence either on the quantity or quality of milk.—D. A. L.

Composition of Alpine and Valley Hay. W. Eugling. Bied. Centr. **14**, 250—252.

Analyses of hay from various localities show that neither the height at which it is grown nor the character of the soil have much influence on the composition of the hay. The author, however, remarks that hay grown at a height of from 1200—1400 meters, has a lower percentage of fibre and ash than that grown in either higher or lower districts, whilst the quantity of albumenoids is greater in the hay from high than from low localities.

—D. A. L.

Beet-nematoïds in France in 1884. A. Girard. Bied. Centr. **14**, 262—263.

When the roots are attacked by these parasites (chiefly the variety *Heterodora Schachtii)* the leaves wither suddenly, become yellow, then develop reddish spots, finally turn quite black and fall off. Moreover, the yield of sugar suffers a very considerable reduction. (See also *Compt. Rend.* 99, 922.)—D. A. L.

Percentage of Alkaloïds in different Varieties of Lupins. E. Hiller. Bied. Centr. **14**, 263.

The author has examined ten varieties of lupins, and tables are given showing the percentage of solid and liquid alkaloïds in each variety. *Lupinus luteus* (yellow lupin) heads the list with a percentage of 0·65 of total alkaloïds, whilst *L. hirsutus* (blue lupin) closes it with 0·04 per cent. of alkaloïds. It is noteworthy that *L. hirsutus*, with this mere trace of alkaloïds, has not a bitter taste. Both the author's and Täuber's results indicate that with regard to the quantity of alkaloïds they contain, the individual varieties nearly always bear the same relation to one another.—D. A. L.

Composition of Horse-Chestnuts, J. Hanamann. Bied. Centr. **14**, 263—265.

The author has analysed horse-chestnuts from various localities, and grown on six soils of different characters. The composition of horse-chestnuts varies to some extent, and the following figures represent the maximum and minimum amounts per cent. of the constituents :—

	Water.	Albumenoids.	Fat.	Matter Convertible into Sugar.	Ash.
Maximum	10·27	8·75	7·07	76·39	2·51
Minimum	7·03	6·56	5·08	72·91	2·17

	P_2O_5	K_2O	CaO	SO_3	MgO
Maximum (per cent. of ash)	28·12	62·05	6·82	3·18	6·32
Minimum " "	22·19	57·22	3·26	1·78	5·40

Chlorine and silica are present in very small quantities, and sodium, iron, and manganese only in traces. Nutritive value is 1:7. The highest per cent. of albumenoid is found in the horse-chestnuts grown on soil poor in lime, and *vice versâ*, whilst the highest amount of fat is found in the nuts from a soil of basalt origin. The horse-chestnut, like the edible chestnut, appears to thrive well on silicious soils poor in lime.—D. A. L.

Nitrogen in Leather Waste. R. Dauguy. Bied. Centr. **14**, 278.

Analyses of various samples of leather from different localities, etc., gave the following percentages of organically combined nitrogen :—

Bullock hide salted in America, tanned in France	6·15
Bullock hide from France	5·43
French cow hide	6·87
White skin refuse from Paris	5·96
Calf tanned black by German process	5·01
Calf cured in Paris	5·75
Calf tanned white by German process	5·93
French horse hide	4·41
Sheep-skin cured in Paris	4·00
Levant goat-skin, black grained, English manufacture	3·57—3·12
" " white " " "	4·87
Russian kid, black glazed	4·83
" " light yellow	4·31

—D. A. L.

Cause of Reversion of Phosphoric Acid in Superphosphates containing Potassium Salts. Schucht, G. Loges and A. Emmerling. Bied. Centr. **14**, 278—280.

From observations made with mixtures of superphosphates with samples of calcined Stassfurt salts, both in presence and absence of iron, the authors conclude that the reversion of phosphoric acid in such mixtures is caused by magnesia. A sample of calcined Stassfurt used in their experiments was found, by titration with acid, to have alkalinity equivalent to 2·05 per cent. of free magnesia.—D. A. L.

Sesame Cake as Cattle Food. A. Ladureau. Bied. Centr. **14**, 281.

The author recommends sesame cake as a partial substitute for linseed cake. A specially pure sample of sesame cake contained per cent. :—

Moisture	12·54
Nitrogenous matter	38·93
Fat	9·60
Starch, dextrin, glucose	3·07
Pectinous substances	12·09
Cellulose	10·57
Calcium phosphate	5·20
Calcium carbonate and sulphate	4·62
Potassium and sodium salts	0·36
Silica, iron oxide, and insoluble silicates	3·06
	100·04

—D. A. L.

Presence of Manganese in Plants, etc. Mounené. Bied. Centr. **14**, 283—284. (*Compare this Journ.* 1884, 528.)

In addition to facts already published (*loc. cit.*) the author has found 0·002 gram of manganese per litre in a sample of Pomard's wine, and only 0·0003 gram of an Algerian wine. Cereals contain $\frac{1}{12000}$ to $\frac{1}{2000}$ of manganese; rye, rice and barley each containing about the same quantity. Manganese has been detected in potatoes, sugar-beet, carrots, cocoa, coffee, tea, and tobacco, the ash of tea containing the largest quantity. The green colour of seed-ashes is attributed to this metal. Manganese is not always present in the blood, but is found in very small quantities in milk, urine, in bones and hair, and in comparatively large quantities in fæces.—D. A. L.

Yellowness of Vines. J. Nessler. Bied. Centr. **14**, 286.

In vineyards there are frequently some vines with yellow leaves. This yellowness is due to insufficient nutrition, and therefore the affected plant cannot thrive. It may be cured by a liberal dressing of quick-acting manure. For this purpose liquid manure mixed with 1lb. of ferrous sulphate (dissolved in water) per hectolitre is recommended; holes are dug round the vine, and the manure is poured in them.—D. A. L.

Sprouted Barley. F. Farsky. Bied. Centr. **14**, 287.

The author's experiments with chevalier barley and rain-water lead him to the following conclusions (compare Behrend, this Journal, iv. 412—413). When barley is soaked in rain-water for a sufficiently long time, it germinates, and at the same time fermentation sets in, producing a change in both the nitrogenous and non nitrogenous constituents of the grain, consequently there is a loss by solution in the water of some of these substances, as well as of some of the original soluble constituents of the grain. This loss is not as great as the loss connected with the actual germination of the barley. If, however, the action of the water be continued until sprouting is complete, then two other processes ensue; the one determines the decomposition of albumenoids, more especially the insoluble varieties, with the evolution of ammonia; whilst the other works the destruction of the fat, and an alteration of the woody fibre. The effect on the product is different in both cases, and is evinced not only in altered composition, but under some circumstances, in loss of germinating power; when, in other words, the sprouted grain becomes useless for brewing purposes. In the author's experiments, 10 per cent. of the steeped barley was rendered useless in this way.

—D. A. L.

Agricultural Value of Sewage. Kiepert. Bied. Centr. **14**, 309—311.

The following results relate to the effects produced by manuring certain fields and meadows with Berlin sewage. On meadow land there is an increase in the yield; Italian rye grass alone or mixed with Timothy grass (cat's tail) yields 4 to 5 or even 6 cuttings of 1 to 1½ foot high, whilst in other meadows 3 cuttings of broad-leaved grasses are taken. The rye grass, according to the author, forms excellent fodder for bullocks, milking cows, sheep, horses, and even pigs; it is very succulent, and takes a long time to dry; the haymaking is therefore conducted on a fallow or stubble field, so as not to interfere with the new growth in the meadow. Mangold-wurzel give very good results with not a single bad harvest in 8 years; with sugar-beet, on the other hand, the results are not so satisfactory. White carrots yield well, and chicory gives as much as 783centnr. per hectare. All kinds of vegetables have been cultivated with the sewage as manure, they grow to a very great size, but only red and white cabbage are at present cultivated on a large scale. Large yields are obtained with hemp, which grows so thick as to drive out all weeds, and also with rape and turnips, which are useful crops, as they take up the manurial matter in the subsoil. Rye, wheat, summer rye, and oats have all been cultivated, and barley to a small extent. Irrigation experiments were also made; in September 1175—1565cm. of sewage water were applied per hectare. In one case rye was sown broadcast in October, and yielded the following August 395kilos. of grain, and 878kilos. of straw per morgen (=0·2553 hectare). In another field, which had grown in the previous year barley after potatoes, chevalier barley was sown in the April after irrigating, throve well, and yielded 508kilos. of grain and 1235kilos. straw per morgen (=0·2553ha.). A bushel weighed 34kilos. In another field, previous cropping had been barley after manured potatoes; oats were sown in April, the plant did well, and yielded 445kilos. of grain and 965kilos. of straw per morgen. The weight per bushel was 23·5kilos. The author recommends the use of sewage-water for agricultural purposes.—D. A. L.

Manurial Experiments. J. König. Bied. Centr. **14**, 319—320.

In various experiments, land which had been exhausted with the growth of lupins was much benefited by manuring with kainite, or, better still, with kainite along with nitrogenous and phosphatic manures, the crop being rye after the lupins; on the other hand, with phosphatic and nitrogenous manures without kainite the beneficial result was doubtful. In other experiments similar results were obtained with these manures with potatoes grown on a species of slatey deposit (Grauwackenschiefer). Moreover, kainite exerted a favourable influence on potatoes receiving lime and liquid manure, and on meadow land manured with superphosphate; in this case the first crop was about the same with or without the kainite, but the aftermath was stronger with the kainite, and contained a considerable quantity of red clover and bird vetch. Experiments with potatoes show that potatoes manured with superphosphate and sodium nitrate yield better in most cases than potatoes manured with the same weight of nitrogen and phosphoric acid as bone-meal, although more bad tubers are always harvested in the former than in the latter case. Quick-acting manures should be used instead of bone-meal on lands where the period of vegetation is short.

—D. A. L.

Artificial Manures for Vines. A. Stutzer. Bied. Centr. **14**, 321—322.

Whilst the cost is about the same, the leaves and wood develop better and the yield of grapes is greater when the vines of black grapes are manured with artificial, than when they are treated with stable manure; the quantity of sugar and acid in the must is not apparently affected by the change of manure. With white grapes the experiments with artificial manures have not been successful, which the author considers is due to the manures not reaching the deep roots of the vines. The manure is composed of 6 per cent. phosphoric acid, 6 per cent. of potash as sulphate, 3 per cent. nitrogen (as ammonia or nitrate). Nitrate is best for vineyards with deep soil.

—D. A. L.

Peat Litter as Manure. Wagner. Bied. Centr. **14**, 352.

Comparative experiments with peat-litter manure, and straw-litter manure, show that the former is better than the latter for potatoes and oats. For barley they are about equal in value.—D. A. L.

Phosphates for Sugar-beet. A. Ladureau. Bied. Centr. **14**, 361.

The present experiments show that precipitated phosphate and superphosphate are about equal in value as manures for sugar-beet, when employed in the quantities used by the author, which, in the case of both manures, were equal to 100, 200, 300, and 400kilos. of phosphoric acid per hectare in the various experiments respectively. The phosphatic manures give rise to a decided increase in the yield, which generally is moderately uniform, but is highest with the 200kilos. of phosphoric acid as superphosphate. The author regards the application of more than 100kilos. of phosphoric acid per hectare as useless.

—D. A. L.

Manurial Experiments with Hops. C. Kraus. Bied. Centr. **14**, 362—366.

The author finds that under favourable climatic influences the application of artificial manures, more especially superphosphate and sodium nitrate, exerts a beneficial action on hops. On the other hand, no advantage was derived by such applications in unfavourable weather. Contrary to expectation, a better yield per stock was obtained when three than when two hop bines were trained on the same pole.—D. A. L.

Maize Silage as Fodder for Milch-kine. Rose. Bied. Centr. **14**, 374—375.

Maize (sour) silage from chopped green maize, put in the silo on 16th September, was given as fodder on 11th October. The rations per cow were 30kilos. of maize silage mixed with one-twelfth its weight of chaffed straw, 1·5kilo. oil-cake, 0·5kilo. wheat-bran, 50grm. common salt, and 20grm. of basic calcium phosphate, the last constituent to correct the laxative properties of the silage. With this fodder the yield of milk increased and the butter was yellow and had a good taste. Ewes in lamb fed with this silage received 0·63kilos. per head. Müller deems it advisable to allow the silo to cool considerably before feeding maize (sour) silage. The temperature in a silo filled by Goffard's method after six weeks was 30° C., and after eight weeks 27·5° C. Souring and heating always ensue. Klein found 2 per cent. of acetic and lactic acids in three samples of maize (sour) silage, and did not observe any considerable increase in acidity during its exposure to the air in removal, etc.

—D. A. L.

Manurial Value (for Barley) of various forms of Phosphates. Fittbogen. Bied. Centr. **14**, 313—318.

Experiments were made with barley in pots in ignited levigated sand. Each pot received 4kilos. of sand, 6 barley plants, and a mixture of 3mllgrm. molecules of potassium chloride, 0·8mllgrm. mol. of magnesium sulphate, 0·8mllgrm. mol. of calcium nitrate, and 1 (or more) mllgrm. mol. of phosphoric acid in some form or other.* Preliminary experiments showed that with one mllgrm. mol. of monocalcium phosphate the result was slightly superior to that obtained by cultivation in garden soil, and much superior to the yield of field cultivation; whilst the disastrous effects of diminishing the quantity of phosphoric acid added were also distinctly indicated. Hence the above mode of investigation by sand cultivation was proved to be quite sufficient for testing the manurial value of various kinds of phosphates. For application soluble phosphates were dissolved in water, insoluble phosphates were mixed with soil; in many cases water saturated with carbonic anhydride was employed, and in other experiments humic acids or calcium humate were added to the sand, etc., in the pots. Nine varieties of phosphates were investigated, and a table of results is given. The following table, an extract from the table mentioned, shows the effect of one mllgrm. mol. of phosphoric acid (=0·142grm. per pot, corresponding to 72kilos. per hectare) in different forms, and under varied conditions :—

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* These quantities of phosphoric acid being regulated according to the recognised value of the phosphates as manures.

MANURING WITH 1 MIL. MOL. OF PHOSPHORIC ACID AS UNDER.	DRY MATTER IN PRODUCE PER POT.	
	Grms.	Total above-ground Growth. Grms.
Mono-calcium phosphate dissolved in water	10·13	20·91
„ „ with calcium carbonate	10·10	21·19
Di-calcium „	9·91	20·53
Tri-calcium „	0·80	3·48
Iron „	1·65	4·93
„ „ with humic acids	3·77	11·01
Aluminium „	4·17	10·20
Mejillos ground superphosphate	9·50	20·83
„ „ „ dissolved in water	9·70	21·26
Lahn superphosphates	3·41	8·01
„ „ dissolved in water	6·81	14·76
„ „ with carbonic anhydride water	3·48	8·31
Precipitated calcium phosphate (Wilhelmsburg)	10·01	18·37
Cladno phosphate	2·00	6·88
„ „ with carbonic anhydride water	3·01	7·31
„ „ with humic acids	7·01	13·77

Thus normal or good yields were obtained with the one mllgrm. mol. of phosphoric acid per pot (=72kilos. per hectare) when applied as mono-calcium phosphate, as Mejillos superphosphate, as di-calcium phosphate, and, as regards the grain, with precipitated phosphate. Increasing the quantity of phosphoric acid applied in these four forms to 2mllgrm. mols. or to 3mllgrm. mols., in the case of the precipitated phosphate did not produce any considerable increase above the normal yield. The absorptive capacity of sand for phosphoric acid is very small, hence the soluble phosphates when applied to the sand were not altered, and this may account for their activity; but even the addition of 0·5 per cent. of calcium carbonate, which increased the absorptive power of the sand, did not reduce the yield. The 6 plants harvested from three of the above experiments contained the following amounts of phosphoric acid:—From the mono-calcium phosphate pot, 0·0587grm.; from the di-calcium phosphate pot, 0·0554grm.; from the precipitated phosphate pot, 0·0488grm.; thus, by means simply of root-activity, even some insoluble phosphates are made to give up the quantity of phosphoric acid required by the plants. Lahn superphosphate and tri-calcium phosphate, when used alone, had to be employed in quantities equivalent to 2mllgrm. mols. of phosphoric acid per pot in order to obtain normal yields of barley; whilst the other phosphates enumerated above do not yield normally, even under these favourable circumstances. The addition of humic acids or calcium humates improves the state of things to a very marked extent, for under these conditions (humic acids) 2millgrm. mols. of phosphoric acid as Lahn superphosphate give the greatest yield of all the experiments; and even Cladno, iron, and aluminium phosphates are awakened to a reasonable amount of activity. The author hence concludes that humic matter is the most important and perhaps only medium which aids the assimilation of phosphoric acid from very insoluble compounds. The author divides phosphatic manures into three groups :—1. Phosphates of greatest activity or most rapid action, such as mono- and di-calcium phosphate, precipitated phosphate, and good superphosphate (from guano, bone-ash, pure apatite, etc.). 2. Phosphates of medium activity, such as tri-calcium phosphate and superphosphates from inferior materials. 3. Phosphates slow in action, such as iron, aluminium and Cladno phosphates. To produce the same effect as a superior fertiliser, an inferior phosphate must be used in proportionately larger quantities, and should therefore cost proportionately less. Field experiments in the same direction have also been conducted, and confirm the results from the pot experiments. Treating with carbonic anhydride water was found to be useless for increasing the activity of insoluble phosphates. The phosphates employed were chemically pure preparations. The phosphoric acid in the superphosphates, etc., was in the following condition :—

	Water soluble.	Citrate soluble.	Total.
Mejillos guano superphosphate	10·18	1·73	21·71
Lahn superphosphate	4·13	5·83	18·81
Wilhelmsburg precipitate	0·33	11·12	28·85
Cladno phosphate	—	6·68	11·36

—*D. A. L.*

Injurious Effect of Hydrochloric and Sulphurous Acid Vapours on Vegetation. J. König. Bied. Centr. **14**, 418—419.

IN a forest exposed to hydrochloric acid vapour the leaves had a sickly appearance similar to that induced by sulphurous acid. The injured oak leaves contained 0·084—0·104 per cent. more chlorine than healthy oak leaves from same forest, whilst in the sickly beech leaves this excess of chlorine was 0·128—0·153. Oats exposed to sulphurous acid vapours, from coke-ovens, etc., were seriously injured and yielded badly; 1000 grains of injured oats weighed only 11·79grm., whilst 1000 grains of healthy oats from another part of the same field weighed 25·30grm. The injured straw contained 1·080 per cent. in dry matter, or 17·22 per cent. in ash, of sulphuric acid in excess of that contained in the uninjured oat straw, whilst the proportion in excess in the grain was 0·308 per cent. dry matter or 6·67 per cent. ash, thus showing without doubt that the sulphurous vapours were the cause of the mischief.—D. A. L.

Pasture Feeding in Oldenburg. H. C. Tantzen. Bied. Centr. **14**, 424—425.

THE following figures show average results of pasture feeding in 1884:—

	Average weight in kilos.		Increase in kilos.			Days in pasture.
	Before feeding.	After feeding.	Highest.	Lowest.	Average.	
3-year old bullocks	505	705	266	106	200	155
2-year old bullocks	411	641	290	195	230	198
Cows	582	723	215	135	191	171

Forty-seven three-year old bullocks required 23 hectares of pasture for the production of 9402kilos. of flesh, and the cost of production was 18·30 marks per 50kilos. live weight. The two-year olds cost about the same; whilst the cows cost 17·35 marks for every 50kilos. live weight produced. Some of the cows calved in January, hence their average increase is rather low.—D. A. L.

Temperature Requirements of the Vine. Roger. Bied. Centr. **14**, 426.

THE following figures are the means of nine years' observation. Vine shoots open as soon as the mean day temperature exceeds 11° or 12° C. Leaf development begins at a mean temperature of 13·6° C., and a mean of 27·5° of rain. From the opening of the shoots until the blossoming, 25 to 32 days intervene, when a mean aggregate temperature of 466° C. is necessary, and from the blossoming to the maturing the grapes require 1926° of heat daily; thus the mean temperature during these 104 to 115 days should be 14·7° C. If the temperature stands below 12·5° during this period, the ripening is interrupted. The mean temperature for the last 20 days of the growth of the grape is 17° C.—D. A. L.

XV.—SUGAR, GUMS, STARCHES, Etc.

Proposed Nomenclature for Sugars. C. Scheibler. Rep. Anal. Chem. **5**, 185.

THE names customary hitherto have not exhibited the division of sugars into the two great groups of which the formula $C_6H_{12}O_6$ and $C_{12}H_{22}O_{11}$ are types. The author proposes to retain the affix *ose* only for the group $C_6H_{12}O_6$, thus—Dextrose, laevulose arabinose, cerasinose, lactose (galactose), sorbin, eukalyn, inosite, dambose, mannitose, etc., and to use the ending *biose* for the invertible sugars of group $C_{12}H_{22}O_{11}$. Hence we should have:—

Saccharobiose	for Saccharose.
Trehabiose (mykobiose)	,, Trehalose (mykose).
Meletibiose	,, Melizitose.
Melibiose	,, Melitose.
Maltobiose	,, Maltose.
Laktobiose	,, Galactose (lactose).

Milk sugar being termed by some writers galactose and others lactose, this causes confusion. The sugar $C_{12}H_{22}O_{11}+H_2O$ would be lactobiose, and its inversion product lactose. To avoid confusion in the case of arabinose, the author proposes "arabose" as a substitute.—H. A. R.

Estimation of Moisture in Starch. L. Boudonneau. Rep. Anal. Chem. 14, 222.

FROM 5 to 10grm. are placed in a drying chamber, the temperature of which rises within three hours to 60° C., and then during one hour to 100° C., and dried until the weight is constant. If the starch be acid, it is dried at 60° C., mixed with its own weight of distilled water and 1 to 2 drops of ammonia, dried again at 40° C., and finally submitted to the desiccating process already described.—E. G. C.

Presence of Potassium and Calcium Salts, etc., in Sugar, Beet and Maize. H. Leplay. Bied. Centr. **14**, 258—259.

IN a former communication the author has shown that potassium and calcium are taken up as carbonates by the roots of sugar-beet during their growth, subsequently these bases are found in all parts of the plant as soluble organic salts; but as the tissue develops the lime becomes insoluble and is deposited. In fact, the amount of sugar formed in the root is in direct proportion to the quantity of lime thus stored up in the plant. The potassium salts, on the other hand, accumulate in the leaves. The author has extended his experiments to maize, and has observed a similar sequence of phenomena. As maize matures in one year, these observations extend farther, and the author shows that the potassium salts accumulate in the leaves until the ears begin to form; they then migrate to the stem, thence by the stocks to the ears, and finally to the seed. Sugar plays an active part in these migrations, and both lime and potash are in maximum quantities in the leaves and stem when the sugar in these parts is at its maximum, and they are present in the seed in greatest quantities when the starch has reached its maximum. An increase of starch in the seed is always accompanied by a corresponding decrease of sugar in the stem.—D. A. L.

Formation of Gum in Wood, and its Physiological Signification. B. Frank and F. Temme. Bied. Centr. **14**, 285—286.

THE authors state that the formation of gum in leaved trees takes place both in the wood vessels and cells, and also in the sap channels. Inasmuch as whenever and in whatever part of the plant a wound is made, there gum is sure to be found. From numerous observations they conclude that the function of gum in leaved trees is similar to the function of resin in conifera. The gum, in fact, serves to protect the wood beneath a wound from the action of air and water, and is found in all wounds whether caused by the falling of leaves, or ravages of insects, or frost, etc.—D. A. L.

Preparation of Sugar from Beet without employing Sulphurous Acid, Animal Charcoal and Gravel. R. Schmidt. Bied. Centr. **14**, 286.

LIME and carbon-dioxide are alone used. No difficulties are encountered, and the yield and quality are good. (See *Deutsche Zucker-ind.* 10 Bd. 1885 [1], 9—10.)—D. A. L.

Improved Method of Decolorising and Clearing Beet Juice by the Lime Process. G. Fritsche's Patent. Bied. Centr. **14**, 286.

0·4% TO 0·6% of clay is taken for each 2½% to 4% of lime employed. The lime and clay are mixed with water, warmed, and boiled up with the juice. The whole is allowed to subside, and is decomposed with carbonic anhydride, etc. Many impurities are precipitated with the clay.—D. A. L.

Preparation of Sugar and Purification of Beet Juices by means of Solutions of Magnesium and Aluminium Hydroxides. Jünemann. Bied. Centr. **14**, 358.

ALUMINIUM hydroxide is dissolved in solutions of aluminium chloride or sulphate, and dialysed until free from chlorine or sulphuric acid. The solution of aluminium hydroxide prepared in this manner yields almost perfectly pure sugar juices. Magnesium hydroxide solutions form granular crystalline magnesium saccharate insoluble in water, with hot sugar juices. (Compare this vol. 461).—D. A. L.

Drying Beet Cuttings. Märcker and H. Schultze. Bied. Centr. **14**, 358.

THE cuttings from the presses are mixed with 1·5 per cent. of lime, as milk of lime; they are then reduced by pressure to 25 to 30 per cent. of dry matter, and are finally dried in a kiln—D. A. L.

Shaded and Unshaded Beets. B. Lach. Bied. Centr. **14**, 394—396.

Beets grown in the shade and in the open field were examined throughout the period of their growth from the middle of August to the end of October, from which observations it is evident that dry hot weather under certain circumstances increases the quantity of sugar in the shaded beets, or in beets cultivated in low and very damp ground. The yield from shaded beet plants is always less than from those not in the shade, although the quality is not inferior.—D. A. L.

Improvements relating to Apparatus for treating Ligneous Substances for the Production of Glucose. H. H. Lake, London. From A. F. Le Mye, and W. de Peyster, Paris. Eng. Pat. 11,407, August 18, 1884.

The improvements herein described are more especially applicable to the "Dangiville" process, in which gaseous HCl is employed to act upon cellulose or woody fibre for the formation of glucose. An annular column is used in which the cellulose is placed; the gaseous HCl is admitted from a main at several points; the annular space at such parts being enlarged to secure the distribution of the gas. The top is made funnel-shaped so as to be more convenient for the introduction of the material; the whole apparatus is kept cool by a stream of water. The operation is completed by washing out the unconverted woody tissue in the same column by a shower of water. The patentee claims considerable economy of time and material.—C. C. H.

Improvements in the Manufacture of Sugar and in Apparatus therefor. W. R. Lake. From F. O. Matthiesen, U.S.A. Eng. Pat. 6432, May 26, 1885.

The object of this invention is the cheap and rapid production of hard white crystalline sugar in the form of cubes or loaves. The process consists essentially of transforming into the above so-called hard sugars, various soft or granulated sugars, especially those known as "A" coffee sugars and "granulated sugars"—which soft and granulated sugars can themselves be prepared from sugars of comparatively low grades by one refining operation. The soft sugars are fitted into moulds of shapes and sizes which vary according to the particular form in which it is desired to obtain the final product. They may be previously dried or they may contain a certain amount of moisture, and they are then treated with a hot concentrated solution of white sugar, which on cooling cements the whole mass together by means of the sugar which crystallises out from the cooled solution. When thoroughly cooled, the mass is drained either by centrifugal or other means, and dried at a comparatively low temperature. The sugar produced has a peculiar glistening appearance, due to the presence of small sugar crystals, not only on its exterior, but also upon its planes of cleavage when broken. The charging of the sugar with "white liquor" may if preferred be performed in an air-tight chamber, from which when charged with sugar the air is exhausted before admitting the liquor. The temperature of the "white liquor," and also of the soft sugar to be operated upon, varies with the nature of the final product required; but the temperature of the "white liquor" may be as high as 220° F., or even higher. As by this method soft or granulated sugars or mixtures of the two are transformed into cakes of hard sugar by a process of cementation by crystallisation, the product of the process is designated "double crystallised sugar." Full descriptions of various kinds of plant and apparatus for carrying out the above process are given, with numerous diagrams.—A. J. K.

Improvements in the Manufacture of Starch, Glucose and other Starch Products. A. M. Clark, London. From the Davenport Glucose Manufacturing Co., U.S.A. Eng. Pat. 6661, June 2, 1885.

In the ordinary process of preparing starch from corn and other grains it is usually the custom to add caustic soda to the starch milk coming from the separators. Instead of caustic soda the author prefers dilute sulphuric acid. This precipitates the starch milk in the settlers, the liquid containing from 0·1 to 0·2 per cent. H_2SO_4. The acid stops fermentation and putrefaction instantly, and the separation of the solid matter is more rapid than when caustic soda is used; the acid water is drawn off from the starch when it has completely settled, and the latter is once more stirred up with a fresh quantity of 0·1 to 0·2 per cent. sulphuric acid. This liquid is then allowed to flow over the starch planes, where the starch settles in a hard mass nearly free from gluten. The trace of sulphuric acid which is present in starch prepared by this process is no detriment if the starch is to be used for the manufacture of glucose or grape-sugar. In cases where the presence of acid would be injurious, it is neutralised with soda and the alkaline sulphate removed by washing. The advantages claimed for the improved process over the old soda process are (1) increased cheapness of production, (2) immediate stoppage by the acid of fermentatian and putrefaction, (3) no gluten is lost in soluble form, as is the case when soda is used.—A. J. K.

XVI.—BREWING, WINES, SPIRITS, Etc.

Use of Grape-Sugar in Brewing. Rep. Anal. Chem. **5**, 188.

Although the Imperial German Brewing Tariff mentions grape-sugar as a malt-substitute, and indeed taxes it most heavily of all the brewing materials—viz., 4 marks per zentner—yet the magistrates of Kempen have fined a brewer for using grape-sugar. This judgment, which was confirmed on 4th March, 1885, by the Imperial Court, rests on the following ground. For longer than five years it has been known that impure grape-sugar (the pure being too expensive for brewing) contains substances incapable of fermentation and injurious to the product. Also that when this sugar is used, fusel-oil is eventually formed, which may under certain circumstances cause the beer to become injurious to health.—H. A. R.

On the Chemistry of Wine. R. Keyser. Rep. Anal. Chem. **4**, 145; and **4**, 167.

The author remarks that, until a more satisfactory basis for the comparison of analyses of wines has been established, we must be contented with such relative results as can be attained with the wines of commerce; and he has collected together a large number of results obtained by him during the year 1883. The processes used were essentially those recommended by the "Society of Wine Analysts." In the sugar determination, 10cc. of Fehling's solution corresponded to 0·05grm. of sugar. For the glycerine estimation, an evaporation-correction of 0·1grm. was allowed for every 100cc. of fluid evaporated, but allowance was also made for any sugar or mineral matter present in the weighed glycerine. A determination of the specific gravity is of little or no value as enabling one to judge of the character of a wine. The analyses of wine given in the author's paper include determinations of the alcohol, extract, ash, total acidity, tartaric acid, sugar, glycerine, phosphoric acid, sulphuric acid, lime, magnesia, and potash. The tables are too long to be included here, and they include analyses of white and red wines from the Palatinate, from Wurtemberg and from the Moselle districts; also of Franconian, Italian, Dalmatian, French and Spanish wines. The author has observed that the average percentages of magnesia and phosphoric acid are considerably less in wines that have been treated with grape sugar during fermentation, according to Gall's process (" Gallisierten Weine ") than in those which have not been so treated. The wines examined may be classed in three groups:—1. Completely fermented wines, containing only small proportions of sugar, tannin, and colouring matter; to this class most of the German white wines belong. 2. Wines rich in tannin and colouring matter, and either completely fermented or containing less than 0·6 per cent. of sugar; to this class belong most red wines. 3. Wines containing considerable quantities of unfermented sugar (such as Malaga, etc.).—E. G. C.

On the Nitrogen Compounds in Barley, Malt and Beer Worts. Bungener and Fries. Rep. Anal. Chem. **14**, 222.

THE authors' observations relate to the effect of malting, and the various brewing processes, upon the quantity and quality of the nitrogen compounds present in the grain. The increase of the soluble compounds by malting, the production of peptones at 40°, and the diminution of the same, together with albuminous bodies, upon heating the worts, are treated of in the paper.—E. G. C.

On an Acid present in Hops. H. Bungener. Rep. Anal. Chem. **14**, 222.

THIS acid was extracted from fresh lupulin, 6kilos. of hops yielding over 400grm. of the acid; it was then crystallised, first from solution in warm alcohol, and afterwards from petroleum ether. From the ethereal solution it is obtained in crystals 1cm. long; it is also soluble in water, in all proportions. This body yields a copper compound with acetate of copper; and its character appears to be that of a weak acid, or of an aldehyde.
—E. G. C.

Wine Coloured with Magenta. Lepage. Bied. Centr. **14**, 286.

MAGENTA was added to wine in proportions equal to 0·20grm. per litre; after six or seven years this colouring matter could not be detected by any known test, either in the wine or in the deposit. It is hence inferred that magenta undergoes some change by prolonged contact with wine.—D. A. L.

Addition of Yeast. Thausing. Bied. Centr. **14**, 288.

FROM brewing experiments with Vienna draught beer, it is proved that the addition of yeast in quantities ranging from one-third to two-thirds of a litre per hectolitre of wort exerts no noteworthy influence on the duration of fermentation, provided the temperature of fermentation remains the same.—D. A. L.

Barley and Brewing Experiments from Experimental Brewery at Weihenstephan, Lintner. Bied. Centr. **14**, 407—408.

THE following are the results of analyses of the 1883 barley from the Munich Scientific Brewery:—

DESCRIPTION OF BARLEY.	In 100 parts of dry matter.				Water.	Germinating Power.
	N.	Albumenoids.	P_2O_5.	Starch.		
Erding	1·616	10·29	1·003	71·28	8·16	30·80
Unterfranken	1·808	11·29	0·931	59·62	17·81	88·60
Bavarian barley	1·661	10·38	1·017	66·15	16·58	90·10
Franken	1·601	10·00	0·913	66·61	11·82	95·40
Freisinger barley	1·623	11·11	0·951	65·81	12·28	80·15
Moosburg	1·585	9·90	0·930	65·16	12·17	83·11
Langenback	1·680	10·50	0·935	65·82	12·67	90·00
Landshut	1·722	10·76	1·031	61·18	13·26	89·20

Brewing experiments were tried with these barleys. The fermentation was normal, but the yield was low, owing to the low germinating power of the barley; and the beer had a characteristic flat taste. Treatment with liquid carbonic anhydride improved the beer considerably in clearness, in taste, and in keeping properties. Carbonic acid has been successfully employed in bottling beer. Finally, the author observes that when barley is cultivated year after year in succession on the same land, without manure, the yield of barley decreases, although its composition does not suffer any important alteration.
—D. A. L.

Production of Spirit from Batatus edulis. Bied. Centr. **14**, 359.

100KILOS. of these tubers (sweet potatoes) will yield 12·0 or even 13·4 litres of pure alcohol. The spirit is so pure that it is used for wine and in the manufacture of rum and brandy. When stored, the tubers require protection from light, air, and moisture, and a temperature of 8° to 12°. They contain about 67·50 per cent. of water, 10·20 per cent. of sugar, and 16·05 per cent. of starch. In the red variety there is 5·31 per cent. of sugar, and 0·76 of glucose; whilst the white variety contains 4·09 per cent. of sugar, and 0·63 of glucose.
—D. A. L.

An Alcoholic Ferment which does not invert Raw Sugar. S. F. Teixeira. Bied. Centr. **14**, 416—417.

THE various ordinary ferments—mycoderma, saccharomyces—were removed from an Italian yeast by successive cultivations in cabbage-water, containing three per cent. of sugar, with 0·003 per cent. of acid potassium tartrate, and left a new yeast in a state of purity. This new yeast is remarkable for its stability of form, dimensions, and appearance (globular cells three to five-thousandths of a millimeter in diameter) under various conditions of cultivation, and moreover differs from all other yeasts that ferment saccharoses, inasmuch as it does not invert raw sugar. Hence it is suggested that it may be employed to separate glucose and raw sugar from molasses; the former would be converted into alcohol, whilst the latter would remain intact.—D. A. L.

XVII.—(*A*) CHEMISTRY OF FOOD. (*B*) SANITARY CHEMISTRY. (*C*) DISINFECTANTS, Etc.

(*A*) CHEMISTRY OF FOOD.

Preservation of Milk. F. Hueppe and W. Eugling. Bied. Centr. **14**, 415—416.

BY heating above 100°, the taste, appearance, and digestibility of milk are impaired. Therefore Hueppe recommends heating the milk in steam for forty-five minutes; all bacillus spores will be destroyed, and the milk will be perfectly fit for keeping. The same object may be attained by heating for one hour at 65° to 70° daily for five consecutive days. Eugling remarks that milk preserved in this manner gradually deposits casein containing a notable amount of calcium phosphate; this may be obviated to a certain extent by evaporating the milk to one-third its volume in a vacuum. The following figures show the composition of milk preserved in this manner, without addition of sugar:—

	1.	2.	3.	4.
Fat	10·82	11·25	12·3	13·1
Albumenoïds	10·33	11·00	11·4	11·8
Milk sugar	11·59	12·12	12·6	14·5
Ash	2·01	2·21	2·2	2·3

No. 4 received some benzoic acid.—D. A. L.

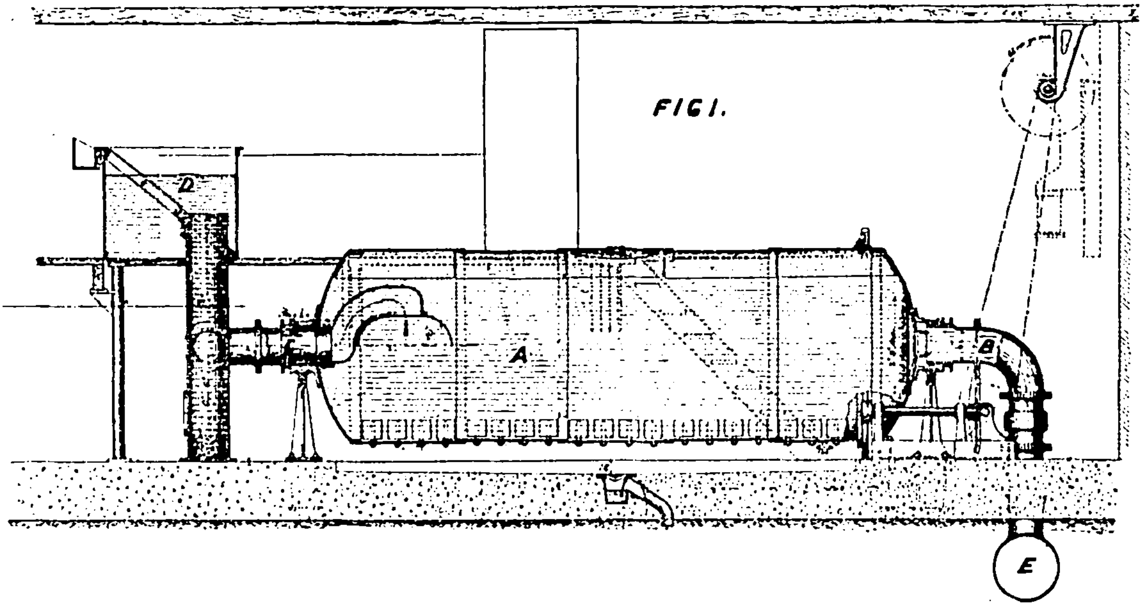
On the Examination of Butter. M. Liebschütz. Jour. Amer. Chem. Soc. **7**, 134.

The author has adopted a modification of David's method of saponification by barium hydrate. Twenty grammes of the clarified butter-fat are saponified with barium hydrate, the alcohol is evaporated off, and the excess of barium removed by sulphuric acid, litmus being used as an indicator. The solution is filtered and concentrated to a syrup, but the glycerol so obtained is not pure. Strong alcohol throws down a large quantity of salts; the alcoholic solution is filtered, evaporated in a tared dish, and the residue dried in the air-bath above 100° C., to a constant weight. The still impure glycerine is then burnt, the weight of the ash being deducted from the total weight; the difference is glycerol. Pure butter gives 13·75 per cent. of glycerol by this method; oleomargarine yields 7·0 per cent. The glycerol derived from pure butter gives five per cent, of ash, while that yielded by oleomargarine is only 0·3 to 0·6 per cent.—E. G. C.

Substitutes for Tartaric Acid in Baking Powders. J. Napier. Analyst, 10, 124.

The author refers to the frequent presence of lead in tartaric and citric acids, and in cream of tartar, substances largely used in the manufacture of baking powders; he condemns the use of bisulphate of potash as a substitute, because of its purgative action; and he writes favourably of the acid phosphates of ammonia, potash, and lime, which can be obtained free from lead, and, together with bicarbonate of soda, are excellent producers of carbonic acid.—E. G. C.

THE PURIFICATION OF WATER
BY MEANS OF IRON ON A LARGE SCALE



(B) SANITARY CHEMISTRY.

Natural Purification of Water. F. Emich. Bied. Centr. **14**, 292—293.

The natural purification of water is shown to be a vital process. Experimental evidence demonstrates that the spontaneous purification of water only takes place when the development of organisms in the water is possible, thus water sterilised by boiling when exposed or agitated with sterilised air undergoes no purification; if, however, it is exposed to or agitated with ordinary air purification proceeds. Other experiments show that perhaps ozone and hydrogen peroxide aid the natural process of purification of water, but at any rate they only play a subordinate part. The author compares the natural purification of water to the formation of nitric acid in the soil. Müller (*Landw. Versuchsstat.* **16**, 263; **20**, 391) has already indicated the probability of the self-purification of water being a vital process.—D. A. L.

The Purification of Water by Means of Iron on the Large Scale. W. Anderson, M. Inst. C.E.; and G. H. Ogston, F.C.S. Proc. Inst. Civil Engineers, vol. 81.

This paper contains a description of the apparatus, devised by one of the authors, for effecting the purification of water by bringing it in contact with spongy iron, as used for purifying the water-supply of Antwerp. The passage of the water through the apparatus is continuous, and the means adopted for ensuring the cleanliness of the surfaces of the particles of iron enables the period of contact of the water and iron to be made much shorter than has hitherto been supposed to be requisite since the method was first proposed by Medlock. Instead of occupying about forty-five minutes, the maximum effect of purification of the Antwerp water is accomplished in 3·5 minutes. The quantity of iron entering into solution is 0·1 grain per gallon; longer contact increases the amount of iron taken up, and does not materially increase the purification. Mr. Ogston has found that the quantity of albumenoid ammonia in different waters is reduced to from one-half to one-third the amount originally present, and the nitrogenous matter remaining behind totally resists the further action of the iron. He further shows that water so purified is practically sterilised, and generally fails to set up putrefactive fermentation in properly prepared solutions of meat extract. Hence he concludes that the nitrogenous matter left in solution is not such as will afford nourishment for the growth and multiplication of germs of infectious disease. The time of contact to secure the maximum amount of purification depends, of course, upon the relative impurity of the water. The apparatus is shown in the drawings on this and following page.

A is a wrought-iron cylinder capable of rotation on its axis, as will be readily understood from the drawing. B and C are trunnions by which the water respectively enters the cylinder from the main E, and delivers into the straining tank D, from whence it is run on to sand filters for the oxidation and removal of the iron taken up. Fig. 2 shows the cylinder in section: during rotation the curved blades at the periphery carry the iron-turnings up to the highest point and discharge them through the body of the water, thus ensuring proper

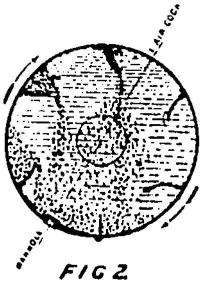


FIG 2

contact with the water and affording sufficient abrasion to keep the surfaces clean. Working upon fifteen million gallons per day, the cost per million gallons is 9s. 9d., and about twenty-eight pounds of iron are employed per million gallons of water purified.
—C. C. H.

On the Presence of Lead in Glazed and Enamelled Cooking Vessels. H. Fleck. Rep. Anal. Chem. 15, 234.

The author has determined the quantities of lead, yielded by glazed vessels, from different manufacturers, and of varying capacity, to vinegar, of from 4—8 per cent. strength, heated in them for one hour. The results obtained are comprised in the following table:—

Capacity of Cooking Vessel.	Lead dissolved on heating with			Total lead dissolved in the three experiments.
	4 per cent. vinegar.	8 per cent. vinegar.	4 per cent. vinegar.	
I. 725cc.	0·0054grm.	0·0048grm.	0·0032grm.	0·0134grm.
II. 2170	0·0060	0·0066	0·0037	0·0163
III. 1085	0·0172	0·0151	0·0123	0·0446
IV. 1110	0·0062	0·0041	0·0022	0·0125
V. 1015	0·0048	0·0069	0·0043	0·0160
VI. 2550	0·0113	0·0152	0·0108	0·0373
VII. 1520	0·0043	0·0035	0·0009	0·0085
VIII. 1035	—	—	—	—
IX. 1310	0·0046	0·0020	0·0006	0·0072
X. 2150	0·0015	0·0014	0·0007	0·0036

A glance at the above table is sufficient to indicate how differently some glazes behave to others, under precisely similar conditions. The result with the glazed vessel No. VIII., shows that a glaze may contain lead, and yet remain unaffected by vinegar.—E. G. C.

The Effect of the Drought of 1884 upon the Pollution of the River Thames below London. R. W. Peregrine Birch, M. Inst. C.E. Proc. Inst. Civil Engineers, vol. 81.

In a former paper in the same journal the author described a method of calculation now known as the "chlorine method" used by him in 1882 to determine the rate at which the Metropolitan sewage is carried away by the river, and the extent of the sewage pollution. The present paper gives an account of observations made during the drought of 1884. The following conclusions are arrived at. All the fresh water and sewage which had entered the river between Teddington and Southend since June 25 was still there on September 8, and that which had entered on June 16 was still there on August 30. The sewage had remained in the river 45 days, and the fresh water occupied 75 days for its passage from Teddington Weir to Southend. There was less fresh water and more salt water in the river than in September, 1882, and the foul mixture travelled seawards at a much slower rate. The calculations also show that though in time of drought there is more sea water in a tidal estuary than a wet season, its circulation is so slow that its effect as a diluent is greatly reduced. The circulation in November, 1882, a time of flood, was nearly three times as great as in August, 1884, a time of prolonged drought.
—C. C. H.

Action of Water on Lead Pipes. C. Schneider. Rep. Anal. Chem. 10, 158.

The soft water of the river Bober, supplying the town of Sprottau, and although containing only traces of sulphuric acid and calcium salts, dissolves considerable quantities of lead from new lead piping. A new lead pipe, 20 metres long, was filled with Bober water, and left to stand 48 hours; the amount of lead dissolved was found to be 0·502grm. per hectolitre. Difficultly-soluble deposits, which form a protecting layer on the insides of the pipes, are thrown down in a short time, not, however, under a period of 24—26 hours. Hard spring-water (containing in a hectolitre 106·0grm. of non-volatile constituents, 10·5grm. of sulphuric acid, 14·44grm. of chlorine, 11·20grm. of lime, and no inconsiderable quantity of nitric acid) dissolved a quantity of lead amounting to 0·351grm. per hectolitre. The author considers that even a small quantity of carbonic acid, accompanied by dissolved air, is sufficient cause for the solvent action of a water upon lead pipes.—E. G. C.

An Improved Method of Softening Water. P. A. Maignen, London. Eng. Pat. 8745, June 9, 1884.

The softening of the water is effected by the addition of a finely-divided mixture of lime, soda, and alum.
—C. C. H.

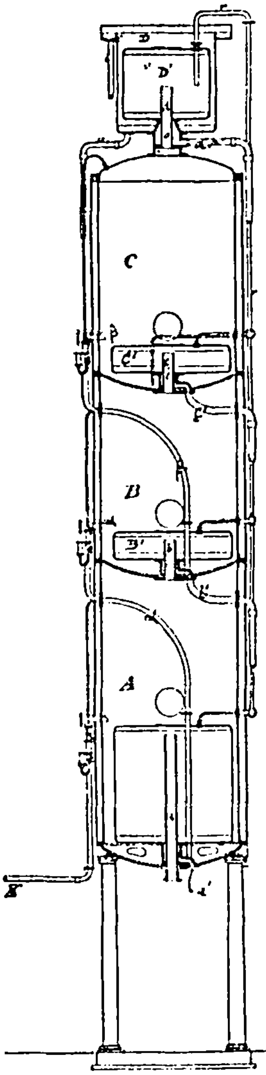
Improvements in the Method of Treating Town Refuse, and Furnace and Apparatus therefor. B. D. Healey, Liverpool; and B. H. Thwaite, St. Neots. Eng. Pat. 10,035, July 11, 1884.

This invention relates to improvements in the furnaces commonly called "destructors," used for burning town refuse, and to appliances for the treatment of the products therefrom. The furnace is constructed with a receiving pit at the level of the roadway, a drying chamber with a sloping bottom, and an inclined fire-grate. A hydraulic lift is provided for the elevation of the clinkers, which are removed from the fire automatically by a reciprocating motion given to the firebars similar to that in "Vicar's" mechanical stoker. A condensing apparatus is placed in the flues so as to obtain useful products from the gases, and to ensure the destruction of all noxious vapours.—C. C. H.

Improvements in Filtering and Treating Sewage. J. Carter, London. Eng. Pat. 10,973, August 6, 1884 (completed April 28, 1885).

THE sewage is collected in a tank or "sewage meter," where it is screened and then precipitated by slaked stone lime, "burned alum," and fine ashes. The mud precipitated is squeezed in long bags horizontally disposed in a suitable press, the bags capable of being opened at both ends. The liquid from precipitation is passed through filtering sacks—C. C. H.

An Apparatus for making Fresh Water from Salt Water. A. Chapman, Liverpool. Eng. Pat. 11,461, August 20, 1884.



THE principle of this apparatus is that of evaporation by multiple effect combined with "evaporation by compression." Three or more closed evaporating vessels are arranged vertically over each other, or otherwise in series. Each pan contains a surface condensing drum open at the lower part to the atmosphere of the pan below it, as shown in the illustration. Sea water is pumped into the lower vessel A, through pipe X, and exhaust steam from the engine which works the pumps enters the drum A¹, through the pipe *a*; part of the vapour generated in A is withdrawn by a compression pump and forced into A along with the exhaust steam. Further evaporation takes place in A, and the steam in A¹ is condensed and led away by pipe *a*¹ to a receiver. By excess of pressure, water from A passes through pipe *a* into pan B, in which evaporation is effected by drum B¹ heated by steam, entering it from pan A through *b*. The condensed water in B¹ is led away through *b*¹. The operation in pan C is similar; water enters from B through pipe *β*, steam is supplied to drum C¹ through pipe *c*, and the water condensed led away by pipe *c*¹. The vapour from C is condensed in drum D¹, situated in condensor D. The condensed water from the three pans passes through a cooler imparting its heat to the cold seawater fed into the apparatus. The operation in the pans is conducted under reduced pressure by means of an air-pump in connection with the condensor D, and the air thus withdrawn utilised for aerating the fresh water obtained from the pans. The sea-water from the top pan is drawn off by a pump and passed through a heater to a steam boiler which supplies the steam to the whole apparatus. The concentrated water from the boiler is frequently blown off, passing first through the heater, giving some of its heat to the partially evaporated water fed into the boiler, and finally through the cooler above mentioned, where it gives up a further quantity of heat to the cold sea-water pumped into the evaporating pans. Little or no heat therefore escapes from the system. The patentee claims the general construction and combination of the apparatus described.—C. C. H.

Improvements in the Preparation of Agents to be used in the Treatment of Sewage, etc., and Improvements in the Treatment of such Matters. E. J. Leveson and J. W. Slater, London. Eng. Pat. 11,641, Aug. 26, 1884.

"KIMMERIDGE blackstone shale," or any other shale which contains alumina in a form readily soluble in hydrochloric acid, and in addition 15 per cent. or more of carbon, is treated with hydrochloric acid and allowed to stand. The mixture so prepared is used for the defecation of sewage in conjunction with chloride of copper, carbon and clay. In all cases the sewage, if acid, must be neutralised. Precipitation is effected in the usual way in tanks. The claims are—(1) the preparation of the shale, (2) the treatment by the reagents as described.—C. C. H.

Improvements in Apparatus for Purifying Water. W. Anderson, Westminster. Eng Pat. 12,256, September 10, 1884.

THE present invention is to remedy a defect in apparatus for which a former patent was granted.—C. C. H.

Improvements in the Purification of Sewage and other Foul Liquids, and in Apparatus therefor. W. Donaldson, I. Shone and E. Ault, London. Eng. Pat. 12,643, September 20, 1884.

IT is proposed to purify sewage by the oxygenating action of the air, alone, or mixed with other gases, such as sulphuric anhydride, oxygen, chlorine, etc. Three methods are proposed:—(1) submitting the sewage in the form of a spray to the action of the air or gases in closed spray chambers; (2) forcing the sewage into the air in the form of a jet, spray, or fountain, thus securing oxygenation and purification; (3) cascading the sewage through the air in the form of a spray from a higher to a lower level through perforated plates. By using one of these methods it is claimed that the oxygen "burns or oxygenates the impurities of the liquid under treatment."—C. C. H.

Improvements in the Purification of Water, etc. F. R. Condor, Guildford. Eng. Pat. 6459, May 27, 1885.

FOR the purpose of (1) purifying sewage or water contaminated with organic matter, or (2) for facilitating the filtration of impure water, or (3) for the preservation of meat, the patentee proposes to use sulphate of iron either in solution or in the crystallised form. In the case of the meat, the surface is covered with a solution of the sulphate iron. Three claims are made for the applications as above described.—C. C. H.

(C) DISINFECTANTS, Etc.

Activity of Antiseptics. Ratimoff. Bied. Centr. **14**, 360.

Seventeen antiseptics were tested on septic and putrefactive bacteria, and on microbes. Determinations were made of the quantity of each antiseptic required to kill or sterilise, and of the quantities which were insufficient to kill or sterilise. From the results of these investigations the antiseptics are arranged in the following order of activity :—(1) Mercuric chloride, (2) silver nitrate, (3) iodine, (4) thymol, (5) copper sulphate, (6) salicylic acid, (7) zinc chloride, (8) phenol, (9) quinol, (10) kairine, (11) resorcinol, (12) chloral hydrate, (13) boric acid, (14) alcohol, (15) oil of gaultheria, (16) bitter-almond oil, (17) eucalyptus oil. The following table illustrates the mode of observation, and the action on meat broth of some antiseptics, diluted as indicated :—

Improvements in Secondary Electric Batteries or Electric Accumulators. C. S. Bradley, Yonkers, U.S.A. Eng. Pat. 2463, February 24, 1885.

An electrolyte consisting of a nearly saturated solution of a metallic bromide is used, the metal being deposited upon one electrode, and the bromine being set free at the other electrode, and taken up by the solution when the battery is charged.—T.

Improvements in Smelting Ores by an Electric Current, and in Furnaces or Apparatus therefor. Eugene H. Cowles and Alfred H. Cowles, both of Cleveland, Cuyhoga County, State of Ohio, U.S.A. Eng. Pat. 6994, June 9, 1885.

This process consists in using granular material of high resistance, mixed with the ore to be reduced, which is placed in a retort constructed of non-conducting material embedded in a substance such as mineral wool, which is not a good conductor of heat. An electric current is made to traverse the entire length of the retort, passing at the same time through the mixed substances required to be reduced.—T.

Antiseptic.	Microbes.		Bacteria.			
			Putrefactive.		Septic.	
	Sterilised.	Not Sterilised.	Killed.	Not Killed.	Killed.	Not Killed.
Mercuric Chloride............	1 : 13,300	1 : 25,000	1 : 800,000	1 : 1,000,000	1 : 66,700	1 : 100,000
Thymol	1 : 2,000	1 : 5,000	1 : 25,000	1 : 50,000	—	—
Salicylic Acid	1 : 400	1 : 500	1 : 1,200	1 : 2,000	1 : 1,000	1 : 2,000
Phenol.......................	1 : 400	1 : 500	1 : 570	1 : 670	—	—

—D. A. L.

A Combined Disinfecting and Fumigating Compound. T. Stoner, Bradford; and J. Turton, Shipley. Eng. Pat. 4677, April 16, 1885.

Twelve parts of finely-crushed common salt are mixed with two parts of tar-oil of 0·700 specific gravity, one part of carbolic acid of 1000 specific gravity, and one quarter part of oil of eucalyptus; chemical action ensues, "the quantity of carbolic acid increases," and the colour changes from yellow to dark grey. Powdered wormwood may be added, equal to one quarter part, when the compound is not required to be wholly soluble in water.—C. C. H.

XVIII.—ELECTRO-CHEMISTRY.

Improvements in Electrodes for Secondary Batteries. R. Tamine, Mons, Belgium. Eng. Pat. 12,824, September 26, 1884.

The author proposes to construct electrodes by heating rosin to its fusing point and adding a mixture of peroxide of lead and lead filings, then letting the mass cement together under a pressure of upwards of one hundred atmospheres.—T.

Improvements in Secondary Batteries, partly also applicable to Primary Batteries. G. G. André, Dorking. Eng. Pat. 13,752, October 17, 1884.

A battery is constructed of elements of two different lengths for convenience of connection, which consists of wooden cores soaked in paraffin and lapped round with a layer of sheet lead or wire; these are held in the cell by a removable frame in such a way that they can be bodily removed and sent to the charging station without necessitating the transport of the cell with the electrolyte contained therein.—T.

XIX.—PAPER, PASTEBOARD, Etc.

The Art of making Paper by the Machine. J. W. Wyatt. Proc. Inst. Civil Engineers, vol. 79, 1884—1885.

1. Materials: Linen, cotton, esparto.
2. Manufacture: Cutting and dusting, boiling, reducing to pulp; (*a*) breaking, including bleaching and washing; (*b*) beating, producing a felted web by means of the paper-making machine; sizing, including animal and vegetable; glazing, finishing.

1. *Materials.*—Vegetable fibre contains 75% to 78% of cellulose, together with glutinous, resinous, siliceous and other intercellular matter which it is the object of the paper-maker to remove as far as possible. Rags, having already undergone a process of manufacture, consist of almost pure fibres, and merely require boiling with an alkaline solution at a low pressure. The substitutes, however, contain all intercellular matter in its original form. Cellulose is untouched by boiling with $NaHO$, unless the action is carried too far. With long and careful manipulation in the pulping-engines, taking precaution to draw the fibre and not to cut it, new cotton will give a much stronger and closer paper than new linen. The author considers that the strongest paper is made from new cotton, and one-fifth or one-sixth of its bulk of new linen. The peculiar value of esparto is the ease with which it is bleached, producing a paper of great whiteness, non-transparent, and when animal-sized, comparing most favourably with that obtained from rags. The fibres of wood are short and brittle as compared with the above-mentioned fibres, and when used alone impart their characteristics to the paper, being too short and thick to yield that suppleness so characteristic of rag-paper. The Russian supply of rags is almost entirely linen, and that of a very strong and fine quality, but coarsely spun, and low in colour.

French and Dutch rags are chiefly cotton, while the German rags are chiefly linen. New linen and cotton cuttings from Great Britain are much superior to those from abroad, being finer and purer. French cottons (used) are flimsy, and when new full of loading and starch. Esparto grass (*Stipa Tenacissima*, or *Machrochloa Tenacissima*), so called in Spain, and Alfa in Africa, is a spontaneous product of the siliceous and ferruginous soils of South and East Spain and North Africa. The cotton rags lose about 27%. 100lb. of raw esparto produces about 31lb. of paper; 100lb. of raw picked flax yield 56lb. of retted flax and only 9lb. of finished yarn, 6¾lb. of bleached yarn; and after losing about 25% in being made into paper, this gives only 5lb. of paper from 100lb. flax; 100lb. of raw picked seed cotton gins into 33·4lb. of ginned cotton. From this 29·4lb. of white cotton yarn are got, and a loss of 20% in conversion gives 23·6lb. paper per 100lb. raw cotton.

TABLE SHOWING LOSSES DURING VARIOUS OPERATIONS.

RAGS.	WATER PER CENT.	SORTING.	CUTTING.	BOILING.	BREAKING AND BLEACHING.
English New Pieces	3	0·5	1·0	3·0	12·5
French „ „	3	0·5	1·2	7·3	13·2
German „ „	3	0·5	1·2	11·8	11·6
No. 1 Cotton	3	0·9	2·0	3·0	12·4
No. 2 „	4	1·2	2·5	7·91	11·8
No. 3 „	4	1·5	3·8	11·16	13·6
No. 4 „	5	2·0	4·0	11·30	17·4
New Soft Tabs	4	0·5	1·0	3·00	8·4
Best White „	4	1·0	4·0	8·60	16·6
Grey Tabs	4	0·8	2·5	15·10	9·8
Unbleached Cotton............	4	0·8	2·0	12 28	13·4
White Moleskins..............	4	0·8	2·0	11·00	8·9
Drab „	4	1·0	2·0	13·00	10·1
Jean Cuttings	4	1·0	2·0	17·40	6·1
Green Cords	5	1·0	2·5	21·30	8·0
Old Blue Cotton	5	1·5	3·8	14·10	9·2
Shirtings	4	0·5	2·6	11·60	12·4
S.P.F.F.F. Linen..............	4	0·8	2·0	8·50	11·8
S.P.F.F. „	5	1·3	2·4	11·10	12·8
S.P.F. „	6	1·8	2·7	17·36	19·6
No. 1 Linen	4	0·5	2·0	6·80	7·4
No. 2 „	5	0·8	2·4	14·50	8·2
No. 3 „	6	1·0	2·7	19·15	9·8
No. 1 Russian Linen	6	1·5	2·4	18·70	10·0
No. 4 „	6	3·0	5·0	30·00	20 7
Linen Duck Clippings	4	0·5	2·0	15·40	9·6
Linen Threads	4	0·5	2·0	12·50	12·6
New Blue Linen	4	0·8	2·0	15·10	13·9
Unbleached Linen	4	0·5	2·0	19·20	10·0

ESPARTO.	BOILING PER CENT.	BREAKING AND BLEACHING.	TOTAL.	REMARKS.
Spanish........................	39·21	11·00	45·92	{ 15·2lb. NaHO. 9·0lb. Bleach.
African........................	40·00	17·18	55·27	{ 20lb. NaHO. 9lb. Bleach.

Spanish grass is shorter and less handsome, but much more easily boiled with less alkali, and bleaches to a good white. The Alfa grass, which is greener and straighter, wastes more, does not come up in colour, and gives a weaker paper. Esparto, during process, has a total loss of about 48%, while all grades of linen and

2. *Manufacture.*—Rags are sorted as follows: Linen and cotton, used and unused, bleached and unbleached, old and new colours and prints, blues, etc. These classes are further subdivided for strength and cleanliness. Rags are first passed through a revolving duster in bulk, and are then cut by hand into pieces of about 14 inches

square. The inherent moisture is from 3% to 6% according to quality, but should not be more. The waste varies with the age and coarseness of the material.

Waste in preliminary dusting and sorting = 0·1% to 6%.
  " cutting and final dusting (for fine new cottons) = 1% to 1·3%.
  " cutting and final dusting (for coarse white cottons) = 2% to 4%.
  " cutting and final dusting (for fine white linens) = 1·5% to 2·5%.
  " cutting and final dusting (for coarse linens) = 2·5% to 3%.
  " cutting and final dusting (for lower grades) = 1% higher.

Esparto, after overhauling, is passed through a thrashing-machine, and is then ready for the boiler. The boilers used are either rotary or stationary—the rotary boiler being often 10 to 25 feet long by 7 feet or more. Frequently they are spherical instead of being cylindrical, and about 8 feet in diameter. An ordinary stationary boiler will take 12 to 18cwt. of rags, and will be worked at 10lb. for from 14 to 12 hours according to material and quality. The alkaline lye used varies, some using lime, others soda, others a mixture of the two. For esparto the pressure is kept at 35 to 40lb. for best grass, the time being 3 to 4 hours. After this boil another is given with plain water for about an hour at 12 to 15lb. in order to remove all caustic solution. Of course steam pressure, amount and strength of lye, etc., varies in every mill. For overhauling after boiling, a machine has been devised similar to, and on the same principle as the paper-machine. The stuff leaves this machine containing about 50% of H_2O, and ready for the beating-engine. Before the present pulping engines were invented, rags were reduced to their original fibres by pounding under heavy hammers. It was a lengthy and cumbersome process, and soon gave way to the "Holländer." For low papers—*i.e.*, wrappers, etc.—the whole process takes place in one engine; but this will not do for higher classes, as the rolls and bars, while suitable for opening, are not suitable for reducing it to fine pulp. Engines are made to hold almost any quantity, varying from 150lb. to upwards of 1000lb. of dry paper. Before bleaching is commenced, all signs of textile nature must have been removed from the material, and afterwards all chlorine must be carefully removed from the pulp to prevent any after action. A heat of 120° to 130° F. is sufficient, and the bleach solution should stand at about 5° Tw. Grass requires 22 to 30 gallons per cwt. of paper made, cotton rags 3 to 11 gallons, and linen rags 11 to 24 gallons. Pronteaux estimates the loss in bleaching at about 1·5% to 3·5% for finer rags, and from 2·8% to 7·5% for coarser grades. The object of adding starch to sizing materials in paper is to render it denser, stiffer, and less spongy. Usually 2% to 4% or more is employed, and added either to the engine direct or else mixed with the size. Writing and printing paper can be made to carry with ease 10% to 20% of clay, and wrappers more than 25%. A considerable amount of attention requires to be given to the drying process in the paper-machine, and Hoffmann calculates about ¾lb. of coal as being required for drying 1lb. of paper. The average speed of a paper-machine on fine writings is from 60 to 70 feet per minute, but on thinner weights the machine may be driven up to 120 feet per minute. A ton of good hide-clippings will produce from 2100 to 2600 gallons of size, which, when diluted to working strength, will give about 2500 to 3100 gallons, and will size from 24,000 to 48,000lb. of paper already one-third engine-sized. Generally 10lb. of alum are required per 100 gallons of size. The following recipe is given for a non-absorbent engine-size:—Dissolve 85lb. of soda-ash at 57% in 60 gallons of boiling water, and in this lye dissolve 6cwt. of ground resin. When cool remove the top layer, which is dark brown, and dilute the lower part with 12 to 13 volumes of water for use. An equivalent quantity of $Al_2(SO_4)_3$ at 7° Tw. will be required for precipitating, and these quantities will size about 20,000lb. of paper. The cost per lb. of engine-sizing is about 0·068d., and that of animal-sizing about 0·486d. All the better papers require smoothing more or less, and this may be done either in the web or in single sheets by hand. Glazing by hand costs for wages and repairs about 0·32d. per lb., calculated on 3,250,000lb. per annum, and with 17 hand-machines. An ordinary web calender will surface at about 300 feet per minute. A very high surface may be given to paper very quickly by "burnishing"—*i.e.* friction and heat. Generally one surface only of the web is so treated. A chilled roll is used on one of cotton or paper, the ration being 4 : 5 = ½ friction. The highest pressure in either hand or calender glazing amounts to ¾ to 1 ton per running inch across the web. The great bulk of the power required is consumed in driving pulping engines. The total horse-power for all purposes may be roughly put at 300 horse-power per 1000 tons of paper per annum for an engine-sized mill, and 380 horse-power for same amount for a tub-sized mill; 75% of this power is consumed in driving pulping engines. This paper is accompanied by two most valuable plates, with illustrations of paper-making machinery, and contains a mass of interesting and useful information for which the original should be consulted.—H. A. R.

Testing Paper. W. Herzberg. Rep. Anal. Chem. **5**, 189.

THERE is in Prussia a Government laboratory where paper is subjected to various tests. These are *mechanical tests—i.e.*, examination as to strength and resistance to tearing,—and *physico-chemical tests*, including the microscopic examination of the fibre, the sizing, determination of certain chemical constituents, of the amount of ash, etc., of different papers. Good paper boiled in water ought not to be changed, whilst a bad paper falls to pieces. The presence of size made from animal matter is determined by treating the aqueous extract of the paper with mercuric chloride, and then with caustic soda. The yellow precipitate, by subsequent heating, is reduced to a black precipitate of metallic mercury, a reaction not ensuing if vegetable sizing materials have been used. The testing as to the permanence and strength of the sizing itself ("Leimfestigkeit") is determined by means of aqueous tannin solution and ferric chloride. The amount of potato starch used for fixing the size is determined by the blue shade produced on dipping the sample in iodine solution. In papers used for certain chemical purposes, it is necessary to be acquainted with the amount of iron present. Mechanical wood pulp is tested for iron with phloroglucol solution, which colours the paper made from it a blood-red tint. Sometimes even free alkali or free acid may have to be sought for. The amount of ash in good papers may, it is stated, reach so high a figure as 1·5 per cent. (*Industrieblätter. Jahrg.* xxii. [9].)—W. S.

Improvements in the Manufacture of Paper Pulp. A. Mitscherlich, Germany. Eng. Pat. 11,816, August 30, 1884.

THE main novel points in this invention are as follows:—(1.) An improved process for mechanically purifying cellulose by guiding the pulp, greatly diluted with water, in a horizontal direction, and at a low velocity, through long and wide channels, and afterwards vertically through a large slit sieve arranged below the level of the liquid, and agitated with a slow vertically alternating motion, substantially for the purpose set forth. (2.) An improved process for drying paper pulp by means of a continuous centrifugal apparatus, in which the water is removed, while the paper pulp remaining on the inside of the screens, forming the surface of the apparatus, is discharged therefrom in consequence of the inclined position of the apparatus.—H. A. R.

Improvements in the Process of, and Apparatus for Boiling Wood with Sulphites. A. Mitscherlich, Germany. Eng. Pat. 11,655, August 26, 1884.

THE most important points in this invention are—(1.) The construction of air-tight kilns by using bricks steeped, when hot, in tar, and by cementing them with mortar containing quartz sand, sieved coal, ashes, etc., with tar. (2.) The conducting of the hot gases through a U-shaped system, cooled by the ordinary current, and, if required, by a special draught. (3.) The employment of the various descriptions of wood for the production of sulphite cellulose of the dimensions specially laid down, and with removal of the bast, and in the case of larch and Scotch fir also of the core. (4.) The method of boiling sawdust in small heaps between larger pieces of wood. (5.) The method of preventing the spent liquors from sulphite boilings from being obnoxious, by discharging *the same through iron pipes into collecting tanks* containing cold liquid, and then causing the same *to mix with about one thousand times their volume of* water. (6.) The method of avoiding discoloration of the cellulose by keeping *the temperature of the material* at or below about 212° F., both before and after the reaction has taken place.—*H. A. R.*

Improvements in Sizing Paper. A. Mitscherlich, Germany. Eng. Pat. 12,566, September 18, 1884.

THIS invention relates to the use in the sizing of paper of materials, such as the extract obtained when fir (*Picea abies L.* or *Picea excelsa*) is subjected to a process of sulphite boiling. "By this new method of sizing certain paper materials special advantages are obtained. In sizing, for instance, the sulphite cellulose, by use of a sufficient quantity of this glue material (extract and resin soap), under otherwise equal conditions, I get, by the afterwards described proceeding, a transparent and very strong product, which, comparatively, is not too brittle, and similar to the paper parchment." If paper sized by this process be further filled with a body like linseed oil, the inventor claims an increase in strength up to 70 per cent., and nearly perfect transparency. The use of such paper is suggested for tracing purposes, for use instead of dim panes of glass, and generally for the uses to which such transparent papers are put, as are intended to give protection against atmospheric influences at a very low expense; also for the manufacture of board and papier-maché textures—H. A. R.

Improvement in Machines for Waxing and Oiling Paper. H. Mason and W. Rawlinson, Middlesex. Eng. Pat. 547, January 14, 1885.

THE object of this invention is to equalise the deposit, and remove the superfluous wax or oil, whereby the quality of the paper is improved, and the cost of production reduced. A scraper, heated by steam, is applied to act on the under surface of the paper immediately on leaving the hot-pressing rolls through which it passes on leaving the bath. The scraper has a bevelled edge, and is heated by conduction by a steam pipe passing through a slot along the whole length of the back of the scraper. The arrangement can be adjusted by screws, and the superfluous matter removed is returned to the bath. Drawings are given, fully illustrating the apparatus.

—H. A. R.

Improved Process and Apparatus for Bleaching Waste-Papers. Wm. Clark, London. From E. A. D. Guichard, Paris. Eng. Pat. 12,385, September 13, 1884.

"WASTE printed and manuscript paper has never hitherto been bleached sufficiently to make it suitable for forming a pulp for the manufacture of white paper." This invention relates to the treatment of such paper mechanically in presence of a bleaching liquid. The machine is illustrated in the accompanying drawing, Fig. 1 being a longitudinal section, and Fig. 2 a transverse section of one arrangement. Fig. 3 shows the interior surface of the drum in the flat, and Fig. 4 is a section taken through the walls of the drum to show the studs fixed therein. A wood drum *a* of suitable dimensions is provided with an opening, at which paper and bleaching liquor is introduced and closed by a wood cover *b*, faced with india-rubber, so as to make a water-tight joint. The interior of the drum is studded with bosses, as shown in Fig. 3. It is also provided with end journals *c*, on which it is mounted in frame *d*, and with a cock *h* for running off the spent liquor. After being cut up, the materials are placed in the cylinder with a quantity of pebbles, and a number of balls of cast-iron or stone, etc. When the drum is revolved the balls and pebbles reduce the paper to pulp, and by means of the bosses the balls and pebbles are projected in all directions. After adding the bleaching liquid required, the drum is revolved until the liquid is almost black, and the operation then repeated if required. Subsequently the pulp is treated in the hydro-extractor to produce cakes of half-stuff with 40—50% of water. The following mixture is recommended for a bleaching liquid:—

Spirits of turpentine	2 parts.
Bleaching liquor	9 „
Soap-suds	9 „

FIG. 1.

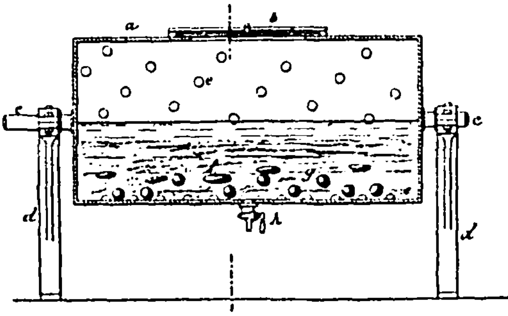


FIG. 2.

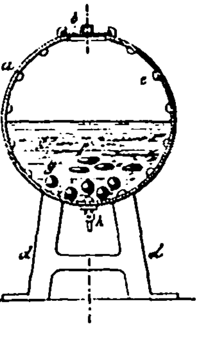


FIG. 3.

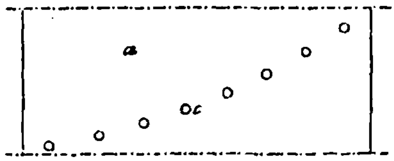
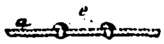


FIG. 4.



The machine may be modified as shown in the sectional elevation in Fig. 5, in which the same letters of reference indicate the same parts as in the previous figures. The improvement consists in fixing a grating or wire cover *j* over the discharge orifice *k*, which is placed at one end of the drum so as to allow of none but clear liquid to pass and to prevent the outlet being choked. The grating *k* is prevented from being clogged by pulp by pressing against a brush *l*, extending its whole length, and fixed upon the rod *m*, one end of which is supported in the hollow inlet pipe *h*, at which the bleaching liquid is introduced, the other end being fitted centrally in the grating *j*. In Fig. 6 the rod *m* is dispensed with, and the inlet and outlet for the liquid is at the same end of the drum. For this purpose the inlet pipe *h* is carried through the back *n* of the brush, and is wholly enclosed thereby, so as to be protected from injury by the pebbles and balls. After passing through the grating *j*, the liquid is received in chamber *o*, bolted to the drum, and escapes through openings *p*.—H. A. R.

FIG. 5.

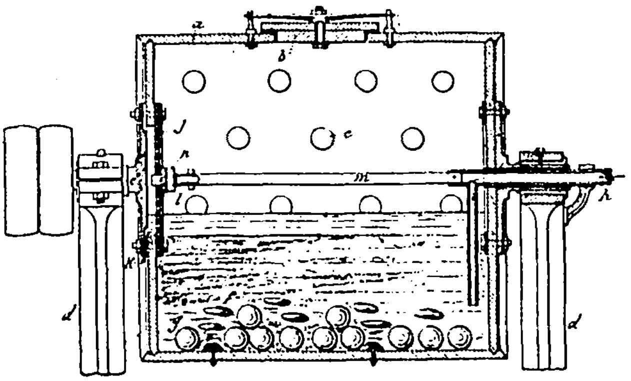
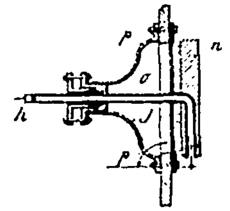


FIG. 6.



Improved Apparatus and Process for obtaining Cellulose and Glucose from Wood. Adolph Behr, Cöthen, Germany. Eng. Pat. 1767, February 9, 1885.

This specification relates to improvements in apparatus described in inventor's patent of July 5, 1884, No. 9797. As novel are claimed the arrangement or combination of several extraction cylinders and their connections with each other, also the construction of the extraction cylinder itself with heating chamber, perforated plates, coolers and stand-pipes.—H. A. R.

Improvements in Softening Vegetable Parchment. H. H. Leigh, Middlesex. From C. Eichhorn, of Jülich; and T. Mohr, of Stozheim, Germany. Eng. Pat. 5010, May 6, 1885.

Inventor claims to be able to render vegetable parchment supple and soft, and more suitable for covering jars and bottles, as well as for other purposes, for which it would be totally unfit as long as it retained its characteristic crispness and non-elasticity. The substance used to effect the said change is applied in the form of a bath, and is made as follows :—

Glycerol	6 parts by weight.
Calcium chloride............	4 " "

Add water until sp. gr. = 18—20° B.

The sheets of parchment, as they come from the maker, are to be immersed in this bath, for a time varying with the thickness of the sheets and the degree of softness required.—H. A. R.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Quantitative Determination of Cinchonidine in Commercial Sulphate of Quinine. De Vrij. Arch. d. Pharm. 11, 452.

Five grm. of the preparation are dissolved in 11cc. of normal sulphuric acid, by warming to about 60° C. The solution is evaporated in a weighed dish till a pellicle forms, and allowed to crystallise. A quantity of distilled water is then added, sufficient to make up the original weight, and the solution which contains the cinchonidine as acid sulphate is shaken with excess of soda and 25grm. of ether. The latter brings the separated cinchonidine in crystals to the surface of the liquid, where they can be collected and weighed. By this method a mixture of 2 per cent. of cinchonidine with quinine sulphate can be detected.—E. G. C.

Improvements in the Manufacture of Salicylic Acid, and of the Homologues thereof. J. Y. Johnson, London. From Dr. F. von Heyden, Dresden. Eng. Pat. 10,167, July 15, 1884.

The object of this invention is to produce one molecule of salicylic acid from one molecule of sodium phenylate without the re-formation of phenol as in the ordinary way. Three methods are described. (1.) Dry CO_2 at the ordinary temperature is passed over dry sodium phenylate; phenyl sodium carbonate is formed. This is heated in a digester to from 120° to 140° C. The salicylic salt is formed by molecular transformation, is then dissolved in water and the acid precipitated by means of a mineral acid, and then recrystallised. (2.) Dry alkaline phenylates are placed in a closed vessel into which dry CO_2 is forced by a pump or else by the evolution of gas from liquid CO_2. If the vessel be kept cool during the process no phenol separates. The phenyl carbonic salt is transformed by heat as before. (3.) The reaction described in (2) is effected by the introduction of solid CO_2, and proceeding as before. The patentee claims the production of phenyl carbonic alkaline salts, etc., and the substitution-salts and homologues as above described.—C. C. H.

Improvements in Anæsthetics. From Robert Jackson Hunter, of Boston, U.S.A.. Eng. Pat. 7343, June 16, 1885.

THIS invention relates to the production of an anæsthetic by mixing nitrous oxide gas with the vapour of alcoholic tinctures of various sedative, anti-spasmodic or diaphoretic substances, such as hops, stramonium, or valerian.

—T.

XXII.—GENERAL ANALYTICAL CHEMISTRY.

Two New Indicators for use in the Volumetric Determination of Caustic Alkalis in the presence of Carbonates. R. Engel and J. Ville. Compt. Rend. 100, 1074.

THESE are sulphindigotic acid and Poirrier's soluble blue (c 4 B.), which are not affected by carbonates, but are altered in colour by caustic alkalis, the first-named being changed to yellow and the second to red. The sulphindigotic acid is prepared by neutralising a solution of indigo in fuming sulphuric acid with calcium carbonate, adding ten times the volume of water, and filtering.

—E. G. C.

Separation of Copper and Cadmium. A. Béhal. Journ. Pharm. Chim. 5 Ser. 11, 553.

A STRONGLY alkaline solution of sodium tartrate produces no precipitate in a solution containing a mixture of copper and cadmium salts. On boiling the solution, all the cadmium is thrown down as oxide, the copper remaining in solution. Ammonium salts must be destroyed by boiling with a slight excess of alkali.

—E. G. C.

New Method for the Determination of Phosphoric Acid by Precipitation with Molybdenum. Meincke. Rep. Anal. Chem. **5**, 153.

THE yellow precipitate, produced by the action of ammonium molybdate on phosphoric acid, loses water and ammonia when heated from 400—500° C., and becomes partially converted into molybdic-molybdenum oxide, a compound which is very stable, only slightly hygroscopic, and admits of accurate weighing. The author finds that it contains 4·018 per cent. P_2O_5, 65·195 per cent. Mo, and 30·787 per cent. O, corresponding to the formula $P_2O_5.4(Mo_6O_{17})$. The solution of the phosphate, acidulated with nitric acid, and containing about 20—25 per cent. of ammonium nitrate, is precipitated at 50—60° C. and allowed to stand without further warming for some hours. The precipitate is collected on a filter and washed with a 20 per cent. solution of ammonium nitrate (slightly acidified with nitric acid) until ten drops give no precipitate with sulphuretted hydrogen, and then with water, or with smaller quantities of water, alcohol and ether. The precipitate and filter paper are as far as possible separated, and ignited separately, the filter paper at as low a temperature as possible. The ashes are then added to the precipitate, and the temperature is raised, so as to be sufficient to cause a slow decomposition of the precipitate, which gradually blackens. When the decomposition is complete, the precipitate, which contains 4·018 per cent. of P_2O_5, is allowed to cool, and weighed. The results are accurate.

—E. G. C.

On Sources of Error in the Determination of Phosphoric Acid. J. König. Rep. Anal. Chem. **4**, 161.

IN numerous cases annoying discrepancies between duplicate determinations of phosphoric acid by different chemists can be traced to incorrect sampling, but the author points out that in a great number of cases these differences are due to the unequal purity of the reagents used. For instance, he has met with molybdic acid, which, employed in the usual manner for the preparation of the molybdic solution, yielded, by reason of its greater impurity, results several percentages too low, as compared with a solution made from pure molybdic acid. Great care is necessary in preparing molybdic acid from molybdic residues in the laboratory. Samples of molybdic acid from three different firms were tested qualitatively for chlorine, nitric acid, and ammonia, and the loss on gentle ignition was determined quantitatively, from which it is obvious that differences in composition between different samples of molybdic acid, or of ammonium molybdate may, in consequence of the variations in strength of molybdic solutions prepared from them, have a serious effect upon the quantitative phosphoric acid estimations, and the author advises analysts to habitually use the preparations from one and the same firm

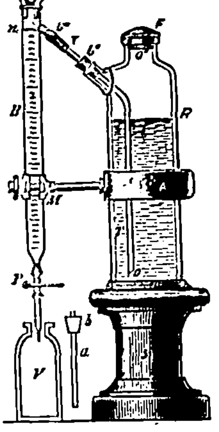
—E. G. C.

On the Examination of Citric Acid for Tartaric Acid. Ph. Pusch. (Arch. d. Pharm. 22, 316). Rep. Anal. Chem. **4**, 176.

ONE gramme of powdered citric acid is put in a test-tube, together with 10grm. of concentrated colourless sulphuric acid. The test-tube is held in a clamp, and suspended in a beaker filled with water, which is now kept at the boiling temperature for an hour. The solution changes to a lemon-yellow liquid, and a considerable disengagement of gas takes place. If the yellow colour of the solution does not alter within an hour, the citric acid was pure; but in the event of its having contained only half per cent. of tartaric acid, the tint of the fluid changes altogether, becoming brown after 30 or 40 minutes, and red-brown after an hour's standing. It is obvious that the crystals of citric acid employed must not contain pieces of wood, paper, etc.—E. G. C.

Improved Burettes. Ducretet. Rep. Anal. Chem. **5**, 185.

A CONVENIENT arrangement for use in laboratories of sugar mills, distilleries, etc., is represented in the cut. The advantage consists in the adjusting of the zero point without pouring in or out, and without loss; also in the rapidity with which tests can be made, and the complete protection of the contents from the air. It is the reservoir for the standard solution, S a heavy sup-



port, B the burette divided into ½cc., A a holder for the same, P a pinch-cock, P¹ an indiarubber ball with an opening *o*, T junction between B and R, F glass-stopper of the reservoir with the opening O², V mixing vessel with the rod *a*. R is filled with solution through F, and the air removed from P¹ by compression and *o* closed. The liquid is thereby drawn up from R to B, and the zero is each time adjusted by the flow through T. The vessel V is more convenient than a flat one, and the rod *a* is for taking samples.—H. A. R.

Volumetric Estimation of Carbon Bisulphide in Sulphocarbonates. Falières. Rep. Anal. Chem. **4**, 219.

TEN grammes of the sulphocarbonate (which can be measured off after the specific gravity has been determined) are mixed, in a granulated cylinder capable of holding 50cc., with 9 to 10cc. of benzene and about 10cc. of water. 20cc. of sodium bisulphite, sp. gr. 1·32, are then added after the mixture has been well shaken. The sodium bisulphite decomposes the sulphocarbonate, and the carbon disulphide formed dissolves in the benzene. The decomposition is complete in about an hour. From 8 to 10cc. of ammonia are now added, and the mixture is shaken and allowed to stand for a little while. The quantity of carbon disulphide present in the sulphocarbonate is calculated from the increase in the volume of the benzene. Tables are given, showing (1) the volumes of sulphocarbonates of different specific gravities, corresponding to the weight 10grm., and (2) the percentages of carbon disulphide corresponding to different increments in volume of the benzene.

—E. G. C.

Detection of Nitric Acid in the Presence of other Acids which conceal its Reactions. Antonio Longi. Rep. Anal. Chem. **4**, 220.

IF acid, the solution is neutralised with sodium carbonate, and then treated with excess of sulphurous acid. The solution is next gently warmed, and sodium carbonate is gradually added till the solution is slightly alkaline. On boiling, chromium and other heavy metals are separated. The filtered solution is acidified with acetic acid, and again filtered if necessary. Pure peroxide of lead and more acetic acid are now added until the vapours given off cease to colour starch paper. The solution is allowed to cool, filtered, and treated with sodium sulphate, which precipitates the dissolved lead. The filtrate is evaporated to dryness on the water-bath, taken up with water, and tested for nitric acid in the usual manner.—E. G. C.

On the Employment of Hydrogen Peroxide in Chemical Analysis. C. Hanowsky. Rep. Anal. Chem. 14, 220.

THE author has studied the action of hydrogen peroxide on compounds of iron, manganese and chromium, and he states that the oxidation of ferrous into ferric oxide can advantageously be effected, in weak solutions of ferrous salts, by boiling with hydrogen peroxide. Manganese is completely separated from neutral solutions of its salts by boiling them with excess of hydrogen peroxide, rendered alkaline by ammonia or potash. The precipitate is washed with hot water (to which a little ammonium nitrate has been added), dried, ignited, and weighed as Mn_3O_4. Hydrogen peroxide in alkaline solution behaves in an analogous way with solutions of chromium salts, the whole of the chromic oxide present being oxidised into chromic acid, which can be estimated either gravimetrically or volumetrically.

—E. G. C.

Report of a Commission to inquire into Uniform Methods for the Analysis of Wine. Rep. Anal. Chem. **4**, 227.

AFTER some preliminary instructions relative to the collection, etc., of samples, the following directions are given respecting the processes to be employed in the analysis. *Specific gravity:*—This is to be determined at a temperature of 15° C., by the aid of the pyknometer, or with a Westphal's balance controlled by means of the pyknometer. *Alcohol:*—For this determination the distillation-method is to be employed, and for the calculation, Hehner's or Baumhauer's tables may be used. *Extract:*—50cc. of the wine, measured at 15° C., are to be evaporated on the water-bath, in a platinum dish (of diameter, 85mm.; height, 20mm.; capacity, 75cc.; and weight, about 20grm.), and the residue dried for 2½ hours. In the case of wines containing more than 0·5 per cent. of sugar, a smaller quantity must be taken, so that the extract shall not weigh more than 1·0—1·5grm. *Glycerol:*—To determine this constituent, 100cc. of the wine are evaporated down to about 10cc., in a spacious porcelain dish; some sand and milk of lime are then added till the reaction is strongly alkaline, and the mixture is evaporated almost to dryness. The residue is next treated with 50cc. of fifty-six per cent. alcohol, warmed and stirred on the water-bath, the solution being then passed through a filter. The insoluble matter is washed with successive small quantities of hot alcohol (fifty-six per cent.), of which 50 to 150cc. will, as a rule, suffice, so that the entire filtrate will be from 100cc. to 200cc. The alcoholic extract is now evaporated to a viscous consistency, and the residue taken up with 10cc. of absolute alcohol; this solution is mixed with 15cc. of ether in a stoppered flask, and the mixture allowed to stand until clear. The clear fluid is decanted or filtered into a light tared glass vessel, carefully evaporated, and the residue dried for one hour in the water-bath. It is then cooled and weighed. In the case of sweet wines (containing more than five per cent. of sugar), only 50cc. of the wine are taken for the estimation of glycerol; sand and lime are added, and the mixture is warmed on the water-bath. After cooling, it is treated with 100cc. of ninety-six per cent. alcohol, the precipitate formed allowed to settle, the solution filtered, the insoluble matter washed with spirit, and the alcoholic filtrate treated as above described. *Free acids* (total acid-reacting constituents of the wine):—Estimated in 10—20cc. of the wine by means of one-third- or one-tenth-normal alkali. Any considerable quantity of carbonic acid to be first removed by shaking. The "free acids" to be calculated into and given as tartaric acid ($C_4H_6O_6$). *Volatile acids:*—Determined by steam-distillation, and calculated as acetic acid ($C_2H_4O_2$). The quantity of *non-volatile acids* calculated as tartaric acid is found by subtracting the equivalent of the acetic acid in tartaric acid from the *free acids* previously determined. *Potassium bitartrate and free tartaric acid:*—a. *Qualitative test for free tartaric acid:*—Some finely-powdered cream of tartar is added to 20—30cc. of the wine, and after the lapse of an hour, the mixture is shaken repeatedly, and filtered. Two or three drops of a twenty per cent. solution of potassium acetate are now added to the clear solution, which is left to stand for twelve hours. (The shaking and standing at rest must take place at as equal temperatures as possible.) Should any considerable precipitate be produced during this time, free tartaric acid is *present*, and its quantitative estimation is necessary. b. *Quantitative estimation of the potassium bitartrate and of the free tartaric acid:*—Two measured quantities of the wine (20cc. each) are put into two stoppered flasks, and mixed with 200cc. of ether-alcohol (in equal volumes). To one flask are added two drops of a twenty per cent. solution of potassium acetate (corresponding to about 0·2grm. of tartaric acid). The mixtures are both well shaken, and allowed to stand 16—18 hours at a temperature between 0° and 10° C. The precipitates are filtered off, washed with ether-alcohol, and titrated. The solution of potassium acetate must be neutral or acid, and it must not be added in too great an excess. In some cases, this method may be controlled by that of Nessler and Barth. *Malic, succinic, and citric acids:*—"Methods for the separation and quantitative estimation of these acids cannot at present be recommended." *Salicylic acid:*—To detect this acid, 100cc. of the wine are shaken repeatedly with chloroform, the latter is evaporated, and the aqueous solution of the residue tested with very dilute ferric chloride solution. For the purpose of an approximate quantitative estimation it is sufficient, on the evaporation of the chloroform, to once recrystallise the residue from chloroform, and weigh it. *Tannin:*—Should a quantitative determination of the tannin appear necessary, Neubauer's method is to be employed. As a rule, however, the following mode of procedure will suffice: the free acids in 10cc. of the wine are neutralised with standard alkali, after which 1cc. of a forty per cent. solution of sodium acetate is added, and finally a ten per cent. solution of ferric chloride, drop by drop, and avoiding excess. One drop of this solution suffices for the precipitation of every 0·05 per cent. of tannin. *Colouring matter:*—Red wines must always be tested for aniline colours; for their detection 100cc. of wine are to be shaken with ether before and after supersaturation with ammonia. The ethereal solutions are separately tested. *Sugar:*—This is determined, after the addition of sodium carbonate, by Fehling's method, and, in wines rich in sugar, with due regard to the modifications introduced by Soxhlet and Allihn; it is calculated as grape-sugar. Highly-coloured wines are to be decolourised by the aid of animal-charcoal or acetate of lead—the latter to be used if the wine be rich in sugar, and then treated with sodium carbonate. Should the polarisation indicate the presence of cane-sugar, the sugar must be determined after inversion of the solution by heating with hydrochloric acid. The cane-sugar is calculated from the difference. *Polarisation:*—For this purpose only large and accurate instruments are to be employed. *Gum (Arabic):*—To ascertain the presence of any added gum, 4cc. of wine are treated with 10cc. of ninety-six per cent. alcohol. In the presence of gum the mixture becomes milky, and only becomes clear again after many hours. The precipitate formed clings to the sides of the vessel in firm masses. In pure wines, a loose flocculent precipitate is formed after a short time, and very soon settles down. To determine the gum accurately, the wine is evaporated to a syrup, treated with ninety-six per cent. alcohol, the insoluble matter separated, redissolved in water, and heated for two hours under pressure with hydrochloric acid (sp. gr. 1·10). The reducing power of this solution is now determined with Fehling's solution, and calculated into dextrose. With pure wine there is no material reduction. Dextrine would also be detected by this method. *Mannite:*—If present, this substance is seen in the form of elongated crystals in the extract and glycerine. *Nitrogen:*—To be determined by the soda-lime process. *Ash:*—For this determination 50cc. of the wine should be taken. *Chlorine:*—The wine is supersaturated with sodium carbonate, evaporated, the residue gently ignited and extracted with water. The chlorine is determined in the solution either volumetrically (according to Volhard), or gravimetrically. *Sulphuric acid:*—Estimated directly in the wine by barium chloride, but only when the qualitative test has shown the presence of an abnormal amount. *Phosphoric acid:*—Determined in the nitric acid solution of the ash, by the molybdic method. *Sulphurous acid:*—100cc. of wine are distilled in a stream of carbonic anhydride, after the addition of phosphoric acid; 5cc. of normal iodine solution are used to receive the distillate. When the first third has distilled over, the distillate, which must still contain excess of free iodine, is acidified with HCl, warmed, and precipitated with barium chloride. *Sophistication of Grape Wine with wine prepared from other fruits:*—The detection of this form of adulteration can, with our present experience, only occasionally be effected with certainty. Specific tests are particularly unreliable; and the conclusion, based upon the absence of potassium bitartrate, or its presence in very small quantities, that a given sample of wine is not the produce of the grape, may not necessarily be a correct one. Among the substances used by manufacturers of adulterated and spurious wines are: Spirit of wine, cane or beet sugar, honey, glycerine, cream of tartar, tartaric acid, other vegetable acids and substances containing them, salicylic acid, mineral matters, gum arabic, tannic acid and materials containing it (kino, catechu, etc.), and foreign colouring matters, together with various ethers and aromatic substances. Tamarinds, dates, and figs are also employed, with the object of increasing the proportions of free acidity, sugar, and extractive matter. In an analysis of wine, the following determinations are, as a rule, necessary:—Extract, alcohol, glycerine, sugar, free acids (total), free tartaric acid (qualitative), sulphuric acid, total mineral substances, gum, polarisation, and (in red wines) foreign colouring matters. In particular cases determinations must also be made of specific gravity, volatile acids, potassium bitartrate, and free tartaric acid, succinic, malic, and citric acids, salicylic acid, sulphurous acid, tannic acid, mannite, total nitrogen, and separate constituents of the ash. Wines derived solely from pure grape-juice rarely contain less than 1·5grm. of extractive matter in 100cc.; after subtracting fixed acids, the proportion of extract remaining should be at least 1·1grm. in 100cc.; and after subtraction of free acids the residue should not be less than 1·0grm. in 100cc. The ratio of mineral matter to extract is about 1 : 10. Free tartaric acid should not amount to more than one-sixth of the total fixed acids. The proportion of alcohol to glycerine, in natural wines, ranges between 100 : 7 and 100 : 14.—E. G. C.

Remarks on the Use of Beckurt's Method for the Detection of Arsenic in Cases of Poisoning. G. Baumert. Chem. Zeit. **9**, 904.

BECKURT lately published some investigations on the detection of arsenic and the preparation of hydrochloric acid free from arsenic. The author examined Beckurt's method, and finds it very convenient. To free hydrochloric acid from arsenic, 1kilo. of pure concentrated commercial acid was treated with 10cc. of a saturated ferrous chloride solution (made by dissolving iron wire in hydrochloric acid), and a small piece of iron wire, and distilled in such a manner that the first 30% of the distillate, and the residue amounting to 10% of the whole, were rejected, whereas the 60% lying between these limits were collected. The latter proved to be absolutely free from arsenic. The same method can be employed to separate arsenic, in cases of poisoning, from various objects, such as internal organs, vomited residues, food, etc. After cutting them up to very small bits, they are stirred up to a thin paste with measured quantities of hydrochloric acid freed from arsenic, treated with 25cc. of a 4% solution of ferrous chloride and distilled. The distillation proceeds very quietly on a gas-stove, and if one-third of the acid used be distilled over, it will contain all arsenic present. The heat must be so regulated that 100cc. of the distillate are produced in 35 to 40 minutes. The apparatus consists of a tubulated retort, of ample size, whose neck is raised and connected in an obtuse angle with a Liebig's condenser. If the object of examination be very liquid, it must at first be evaporated with hydrochloric acid, if necessary, after neutralising with sodium carbonate, and afterwards distilled, as mentioned above. It makes no difference in the method of proceeding, whether arsenic is present as element, trioxide, pentoxide, or sulphide. The hydrochloric acid distillate can at once be subjected to the treatment in the Marsh's apparatus, but the liquid must be previously diluted, and a very strong evolution of hydrogen should be avoided. The gas is dried by passing through tubes filled with calcium chloride and potasssium hydrate respectively. In every case, a blank experiment with the reagents to be used, must be previously made.—S. H.

New Method for the Separation of Strychnine and several other Alkaloids in cases of Poisoning. Th. Chandelon-Zeit. f. Physiol. Chem. **9**, 46-48.

THE finely-divided viscera mixed with an equal weight of anhydrous gypsum are dried at 70°, and then warmed with tartaric acid and 90 per cent. alcohol. The residue of the alcoholic extract is taken up with a little warm water, neutralised with soda, mixed with gypsum, dried in a desiccator, and extracted with chloroform. The chloroform extract is treated with an equal volume of a saturated solution of oxalic acid in ether, the oxalates of strychnine, brucine, narceine, codeine, nicotine, coniine, aconitine, hyoscyamine, veratrine, papaverine, and thebaine are precipitated after some time; completely in 24 hours. The oxalate of strychnine is washed with ether and chloroform, dissolved in water and precipitated by ammonia. In quantitative estimations, one adds to the weight of the precipitated strychnine the weight of that dissolved in the solution (according to the author, 1 part in 6667). With the other alkaloids the oxalate is dissolved in alcohol, the oxalic acid removed with alcoholic potash, the potash by passing carbonic acid through the mixture, and the pure alkaloid is then obtained by evaporation of the alcoholic solution—S. R.

New Books.

Physico-Chemical Constants, Melting and Boiling Point Tables. By Thomas Carnelley, D.Sc., B.Sc., F.C.S., Professor of Chemistry in University College, Dundee. Vol. I. London: Published by Harrison & Sons, 59, Pall Mall, 1885.

Quarto Volume, bound in black cloth, containing preface, table of contents, explanatory notes, list of abbreviations alphabetically arranged, catalogue of reference literature (with abbreviations) also alphabetically arranged, and subject matter in the shape of the tabulated constants, etc., extending over 352 pages; price £2 2s. This important work the author has very appropriately dedicated to his old teacher, Sir Henry Enfield Roscoe, LL.D., F.R.S. The tables are arranged in vertically divided columns, headed as follows:—Name (of Substance); Remarks; Formula; Boiling Point; Melting Point; Authority; Reference; *Watts. Dict.* and *Journ. Chem. Soc.* The table of contents includes the following, and thus the compass of the first volume of this work will appear:—Part I.—Elements and Inorganic Compounds. I. Elements. II. Compounds containing *two* Elements. III. Compounds containing *three* Elements. IV. Compounds containing *four* Elements. V. Compounds containing *five* Elements. VI. Metallic Alloys:—*a.* Alloys of *two* metals; *b.* Alloys of *three* metals; *c.* Alloys of *four* metals. VII. Alloys of Inorganic Compounds: *a.* Alloys of *two* compounds; *b.* Alloys of *three* compounds. Part II.—Organic Compounds. I. Compounds containing *two* Elements. II. Compounds containing *three* Elements. The "Apology for writing this book" by the author, it is only fair to state. Those who imagine the work to be one of essential value for reference for chemical formulæ, melting- and boiling-points are entirely correct, but it serves another equally valuable purpose, for the research-chemist perhaps a still more valuable one—viz., to take the place of a class of works possibly better known in Germany than in this country, as a] "*General-Register*," for ready and rapid reference to the original sources in the whole of the literature of chemical experience or research. In the preface Dr. Carnelley writes:—"My object in preparing the tables has been—*First:* To present as complete a list as possible of *all* known melting- and boiling-point data, and at the same time to indicate which of them is probably the most exact when there are several determinations referring to the same substance. *Second:* To state as fully as possible the constitution of each substance to which the data refer. *Third:* To adopt such a system of arrangement as would facilitate, as far as possible, the ready finding of the data relating to any given substance. *Fourth:* To give the authority and reference to the original memoir in each case. *The tables thus form a catalogue also of the literature referring to most chemical substances. Fifth:* As but comparatively few chemists have sufficiently large libraries of their own, or can conveniently refer to the original papers in all cases, I have thought it desirable to give in addition the reference (if any) to either *Watts' 'Dictionary of Chemistry,'* or to the *'Journal of the Chemical Society of London,'* or both. This is a feature of the work which I believe will be found particularly useful, more especially to British and American investigators."

Monthly Patent List.

ENGLISH APPLICATIONS.

1885.

I.—GENERAL PLANT, APPARATUS, AND MACHINERY.

9318 J. Hill, Glasgow. Improvements in and connected with gas-producers, and regenerators or furnaces, and their construction and arrangement and fittings as applied to steam boilers for the generation of steam. August 19

9330 W. Hutchinson, London. Improvements in refrigerating apparatus. August 21

10083 J. Storer, Glasgow. Improvements in constructing furnaces, converters, flues, and other apparatus in which great heat is employed. August 26

10112 A. Reis, London. An apparatus for producing a draught in boiler and other furnaces, and for purifying the products of combustion. August 26

10143 J. A. Drake and R. Muirhead, London. Improvements in and connected with filter presses. August 27

10166 J. Johnston, Manchester. Improvements in apparatus for heating, drying, and other purposes. August 27

10169 B. H. Remmers and J. Williamson, Glasgow. Improvements for facilitating the removal of cakes or sludge from filter presses. August 27

10258 A. Dempster, Elland. An improved fastening for retort lids, furnace doors, covers, and the like. August 29

10355 E. Edwards, London—Communicated by G. Lunge, Switzerland, and L. Rohrmann, Germany. Improvements in apparatus for effecting the absorption of gases by liquids or solids. September 1

10570 B. H. Remmers and J. Williamson, Glasgow. Improvements in filter presses. September 7

10618 J. Binks Cooper, Whitehaven. Improvements in stationary boiler flues for economising fuel and consumption of smoke. September 9

10657 F. Bernard Dœring, London. Improvements in apparatus for evaporating sea-water, nitrate, or other solutions or liquids. September 9

10663 E. Edwards, London—Communicated by E. Fourcault and E. Jacques, Belgium. Improvements in regenerative hot-air furnaces. September 9

II.—FUEL, GAS, AND LIGHT.

9773 H. J. Allison, 'London—Communicated by C. Carroll Yeaton, United States. Improvement in process of generating hydrogen gas. Complete specification. August 18

9797 H. Ffrench Bromhead, London. Improved device or apparatus for purifying gas. August 18

9876 J. Murrie, Glasgow. An improved method of generating vapour. August 20

10139 J. Kingsford Field, London. Improvements in treating hydrocarbon bodies or substances. August 27

10231 L. Chandor. A tischolin candle. Complete specification. August 29

10301 J. H. Selwyn, London. Improvements in liquid fuel furnaces and their appliances. August 31

10535 H. J. Haddan, London—Communicated by W. St. Martin, Belgium. Means or apparatus for obtaining an inflammable gas mixture from mineral oil and water or steam, and for utilising the said mixture for the production of heat and light. September 5

10666 C. W. Bradshaw, Tottenham; and J. Carpenter, Hammersmith. Apparatus for generating gas for illuminating and other purposes from mineral and other oils. September 9

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, Etc.

10138 H. J. Haddan, London—Communicated by J. Quaglio, Germany. Apparatus for compressing coal and introducing the same into coke-ovens. September 3

IV.—COLOURING MATTERS AND DYES.

9858 J. H. Johnson, London—Communicated by The Badische Anilin- und Soda-Fabrik, Germany. Improvements in the manufacture of yellow and orange colouring matters suitable for dyeing and printing from dioxytartaric (carboxytartronic) acid. August 19

10377 W. Clark, London—Communicated by the Fabrik vorm. Brönner, through Wirth & Co., Germany. Improvements in the production of colouring matters. September 1